A REVIEW OF THE CHROMOSOME NUMBERS IN THE METAZOA

Part I

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The following tabulation comprises the chromosome work that has been done since the pioneer researches of Van Beneden in 1883 until the end of 1915. The list is as complete as possible, and recourse has been had in all cases to the original publications. All the authorities have been given for each species, even when the accounts are conflicting, and these are given in the order of priority. All the species are classified and the various phyla, genera, families and species are arranged in alphabetical order. The present paper includes the Annelida, Arthropoda and Coelenterata, and will be followed by a second paper including a tabulation of the other invertebrates (excluding Protozoa) and the vertebrates together with some general remarks. Some of the most important abbreviations are:

chrom = chromosome
cl = cleavage
div = division
el = elements
fert = fertilized
mat = maturation
oog = oogonia
pa = parthenogenetic
p.b. = polar body
prim = primordial
pron = pronucleus
som = somatic
spc = spermatocyte
spg = spermatogonia

"X to pole" means that X passes undivided to one pole.
"XY to poles" means that X and Y pass to opposite poles.
"From correction in" means that the tabulation as given is a correction of an earlier account.

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SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
A. INVERTEBRATA							
I. ANNELIDA							
a. ARCHIANNELIDA							
Dinophilus gyrociliatus..	20 cl♂ 20 cl♀	20♂egg (= 10 double) 20♀egg (= 10 double)	10♂ egg (double)	10♂ egg (double)		Shearer, '11 Shearer, '12	Jour. Marine Biol. Assoc., 9, p. 156 Q. J. M. S., 57, p. 329
Histriobdella homari.....		8♀				Shearer, '10	Q J. M. S.. 55, p. 287
Protodrilus purpureus....		4♀	4♀	4♀		Pierantoni, '08	Flora u. Fauna Golfes Neapel, 31, p. 1
b. CHAETOPODA							
1. Oligochaeta							
Allolobophora foetida....	22 oog	11♀	11♀	11♀		Foot, '98 Foot and Strobell, '05 Foot and Strobell, '10	Jour. Morph., 14, p. 481 Amer. Jour. Anat., 4, p. 199 Arch. Zellf., 5, p. 149
Enchytraeus adriaticus...	24 oog					Vejdovský, '07	Kgl. böhm. Ges. Wiss. Prag, '07, p. 1
Enchytraeus humicultor.	32 spg 32 oog	16♀				Vejdovský, '07	Kgl. böhm. Ges. Wiss. Prag, '07, p. 1
Fridericia hegemon.....	64 spg 64 oog	32♀				Vejdovský, '07	Kgl. böhm. Ges. Wiss. Prag, '07, p. 1
Ilyodrilus coccineus.....		16♀				Vejdovský and Mrázek, '03	Arch. mikr. Anat., 62, p. 431
Lumbricus agricola.....		16♂ (= 64 el)	16♂ (= 32 el)	16♂		Bugnion and Popoff, '05	Arch. Zool. exper. et gen., Ser. IV, vol. 2, p. 339
Lumbricus terrestris.....	32 spg	16♂	16♂	16♂		Calkins, '95	Jour. Morph., 11, p. 271
Lumbricus (sp. not given)	32 spg	16♂	16♂			Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
Mesenchytraeus flavus...		16♀				Vejdovský, '07	Kgl. böhm. Ges. Wiss. Prag, '07, p. 1

Mesenchytraeus setosus..	32 oog	16♀				Vejdovský, '07	Kgl. böhm.Ges. Wiss. Prag, '07, p. 1
Rhynchelmis limosella...	64 cl	32♀	32♀	32♀		Vejdovský and Mrázek, '03 Vejdovský, '07	Arch. mikr. Anat. 62, p. 431 Kgl. böhm. Ges. Wiss. Prag, '07, p. 1
Tubifex rivulorum.....	ca 100 cl	ca 110♀				Gathy, '00	La Cellule, 17, p. 7
			2. Polychaeta *a.* Archichaetopoda				
Saccocirrus major.....	8 spg	4♂ 4♀	4♂ 4♀	4♀		Hempelmann, '13	Zoologica 26, p. 249 (=Festschrift für Chun)
Saccocirrus major.....	18 spg 18 oog 18 cl	9♂ 9♀	9♂	9♂		Von Baehr, '13	Zool. Anz., 43, p. 10
Saccocirrus papillocercus.	6 cl					Pierantoni, '06	Mitt. Zool. St. Neapel, 18, p. 46
Saccocirrus papillocercus.	8 spg	4♂ 4♀	4♂ 4♀	4♀		Hempelmann, '13	Zoologica 26, p. 249 (= Festschrift für Chun)
			b. Errantia				
Nereis limbata.....	20–30 cl	14♀				Bonnevie '07 Bonnevie, '08	Biol. Bull., 13, p. 57 Arch. Zellf., 2, p. 201
Platynereis megalops.....		14♀		14♀		Just, '15	Jour. Morph., 26, p. 217
Ophryotrocha puerilis....	4 spg 4 oog 4 som 4 cl 8 in some blastulae	2♀	2♀	2♀		Korschelt, '95 Korschelt, '95	Verh. deutsch. Zool. Gesel., 5, p. 96 Zeits. wiss. Zool., 60, p. 543
Ophryotrocha puerilis....	8 spg 8 oog 8 som	4♂ 4♀	4♂			Schreiners, '06	Anat. Anz., 29, p. 465
Ophryotrocha puerilis....	8 spg 8 som	4♂	4♂			Gregoire and Deton, '06	La Cellule, 23, p. 433
Ophryotrocha puerilis....	4 (pairs) spg 4 (pairs) som	4 (pairs)♂	2 (pairs)♂	2 (pairs)♂	2 to each pole in 1st	Dehorne, '10 Dehorne, '11	Zool. Anz., 36, p. 209 Arch. Zool. exper. et gen., Ser. V. vol. 9, p. 1

I. ANNELIDA—Continued

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Tomopteris elegans.....	10 oog	5♀				Senna, '11	Arch. ital. Anat. Emb., 9, p. 299
Tomopteris onisciformis..		4♀				W. Wallace, '04	Brit. Assoc. Adv. Sci., 73, p. 282
Tomopteris onisciformis..	18 spg	9♂				Schreiners, '06	Arch. Biol., 22, p. 1
c. Sedentaria							
Amphitrite.....	22 cl 11 pa cl	11♀	11♀	11♀	2 p.b.s. and 11 pa cl. Sometimes no p.b. and 22 pa cl	J. W. Scott, '06	Jour. Exp. Zool., 3, p. 49
Aricia.....	18 cl 9 pa cl	9♀	9♀	9♀	2 p.b.s. and 9 pa cl. Sometimes 1 p.b. and 18 pa cl	Kostanecki, '09	Bull. Inter. Acad. Sci. Cracovie, '09, p. 238
Chaetopterus pergamentaceous.....	18 cl	9♀	9♀	9♀		Mead, '98	Jour. Morph., 14, p. 181
Chaetopterus pergamentaceous.....		9♀	9♀			Lillie, '06	Jour. Exp. Zool., 3, p. 153
Lanice conchylega.....	6 (pairs) som	6 (pairs)♂	3 (pairs)♂	3♂		Dehorne, '11	Arch. Zool. exper. et. gen., Ser. V, vol. 9, p. 1
Sabellaria spinulosa.....	8 (pairs) spg 8 (pairs) som	8 (pairs)♂ 8 (pairs)♀	4 (pairs)♂ 4 (pairs)♀	4 (pairs)♀		Dehorne, '10 Dehorne, '11	C. R. Acad. Sci. Paris, 150, pp. 1195 and 1625 Arch. Zool. exper. et gen., Ser. V, vol. 9. p. 1
Serpula crater.....		ca 14♀		ca 7♂ pron ca 7♀ pron		Soulier, '06	Arch. Zool. exper. et gen., Ser. IV, vol. 5, p. 403
d. Appendix-Myzostomidae							
Myzostoma glabrum.....	24 cl	12♀	12♀	12♂ pron 12♀ pron		Wheeler, '97	Arch. Biol., 15, p. 1

c. Gephyrea

1. Armata

Thalassema mellita.....	24 cl	12♀				Griffen, '99	Jour. Morph., 15, p. 583
Thalassema mellita.....	12 pa cl	12♀	12♀	12♀		Lefevre, '06 Lefevre, '07	Science, 23, p. 522 Jour. Exp. Zool., 4, p. 91
Thalassema mellita.....		12+♀	16–17♀			Bonnevie, '08	Arch. Zellf., 2, p. 201

2. Inermia

Phascolosoma gouldii... Phascolosoma vulgare..	20 cl (= 10 bivalent in vulgare)	10♀	10♀			Gerould, '04	Arch. Zool. exper. et gen. Ser. IV, vol. 2, p. XVII
						Gerould, '06	Zool. Jahrb., 23, p. 77
Sipunculus nudus.....		10♀			Observation of Francotte	Gerould, '06	Zool. Jahrb., 23, p. 77

d. Hirudinea

Clepsine complanata.....		20♀				Gathy, '00	La Cellule, 17, p. 7
Nephelis vulgaris = Herpobdella atomaria.....	16 oog	8♀				Jörgensen, '08	Arch. Zellf., 2, p. 279
Piscicola.....		16♀				Jörgensen, '13	Arch. Zellf., 10, p. 127

II. ARTHROPODA

a. Arachnida

1. Acarida

Ixodes reduvius.....	ca 28 spg	14♂				Nordenskiöld, '09	Zool. Anz., 34, p. 511
Pediculopsis graminum...	4 cl (sometimes fused)			2♂ pron 2♀ pron	= karyomeres	Reuter, '09	Acta Soc. Sc. Fen., 37, no. 7, p. 1

2. Araneida

Agalena naevia.....	52? spg			25, 27?♂	2 X to pole in 1st. From correction in '09	L. B. Wallace, '00 L. B. Wallace, '05 L. B. Wallace, '09	Anat. Anz., 18, p. 327 Biol. Bull., 8, p. 169 Biol. Bull., 17, p. 120
Agalena naevia.....		ca 15♂				Painter, '14	Zool. Jahrb., 38, p. 509
Amaurobius sylvestris....			17+♂		X to pole in 1st. Supernumeraries	Painter, '14	Zool. Jahrb., 38, p. 509
Anyphaena saltibunda...		10♂			X to pole in 1st	Painter, '14	Zool. Jahrb., 38, p. 509

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Callipes imbecilla		11♂			X to pole in 1st	Painter, '14	Zool. Jahrb., 38, p. 509
Clubiona		22–26♂				Carnoy, '85	La Cellule, 1, p. 189
Dugesiella hentzi		22♂			X to pole in 1st	Painter, '14	Zool. Jahrb., 38, p. 509
Dolomedes fontanus		13♂			Double X to pole in 1st	Painter, '14	Zool. Jahrb., 38, p. 509
Epeira scolopetaria	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Berry, '06	Biol. Bull., 11, p. 193
Lycosa communis		11♂			X to pole in 1st	Painter, '14	Zool. Jahrb., 38, p. 509
Lycosa insopita	28 spg	13♂	13♂ (12–15)		Pair small chroms. in spg usually absent in spc. Equal XY	Montgomery, '05	Proc. Acad. Nat. Sci. Phila., 57, p. 162
Maevia vittata	28+ spg 29+ oog	15♂			X to pole in 1st	Painter, '14	Zool. Jahrb., 38, p. 509
Oxyopes salticus		11♂			X to pole in 1st. Supernumeraries	Painter, '14	Zool. Jahrb., 38, p. 509
Tegenaria atrica		18–24♂				Carnoy, '85	La Cellule, 1, p. 189
Tegenaria sp?		6–12♂				Carnoy, '85	La Cellule, 1, p. 189
Theridium tepidariorum	24 cl	12♀	12♀	12♀		Montgomery, '07	Zool. Jahrb., 25, p. 237
Xysticus triguttatus		11♂			X to pole in 1st	Painter, '14	Zool. Jahrb., 38, p. 509
3. Scorpionidae							
Buthus eupeus	ca 22 spg					Sokolow, '13	Arch. Zellf., 9, p. 399
Euscorpius carpathicus	70–84 spg	28–40♂ (probably 32)	28–40♂			Sokolow, '13	Arch. Zellf., 9, p 399
Scorpio occitanus (= Buthus)		22–28♂				Carnoy, '85	La Cellule 1, p. 189
4. Appendix—Tardigrada							
Macrobiotus lacustris	10 cl	5♀	5♀	5♀		Von Wenck, '14	Zool. Jahrb. Abt. f. Anat., 37, p. 465

b. Crustacea

1. Entomostraca

a. Cirrepedia

Lepas anatifera			4–12 ♀ (mostly 4 or 5)			Groom, '94	Phil. Trans. Roy. Soc., 185 B, p. 119

b. Copepoda

Anomalocera patersonii	16 (double) oog 32 som	16 ♀ (= 64 el)	16 ♀ (= 32 el)	16 ♀		Vom Rath, '95	Arch. mikr. Anat., 46, p. 168
Calanus gracilis		16 ♀				Konrhauser, '15	Arch. Zellf., 13, p. 399
Canthocamptus staphylinus	24 oog ca 12 (double) el	12 ♀ (= 48 el)	6 pairs ♀ (= 24 el)	6 ♀ (= 12 el)		Häcker, '92 Häcker, '95	Zool. Jahrb., 5, p.211 Arch. mikr. Anat., 45, p. 200
Canthocamptus staphylinus		12 ♀	12 ♀	12 ♀	Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Canthocamptus staphylinus		12 ♀ (double)				Krüger, '11	Arch. Zellf., 6, p. 165
Canthocamptus trispinosus		11 ♀ (double)				Krüger, '11	Arch. Zellf., 6, p. 165
Cyclops affinis		7 ♀			6 ditetrads + 1 heterochromosome	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops albidus	14 som		7 ♀		Ditetrads	Braun, '09	Arch. Zellf., 3 p. 449
Cyclops albidus		7 ♀			Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Cyclops albidus	14					Chambers, '12	Univ. Toronto Studies, 14, p. 1
Cyclops bicuspidatus	18 som	9 ♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops bicuspidatus		9 ♀			Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Cyclops bicuspidatus	18					Chambers, '12	Univ. Toronto Studies 14, p. 1.
Cyclops bicuspidatus var. odessana	18 som	9 ♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops bicuspidatus var. odessana		9 ♀			Ditetrads	Matscheck, '10	Arch. Zellf., 5, p. 36

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Cyclops brevicornis sec Cyclops viridis							
Cyclops diaphanus.....	12 som	6♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops distinctus sec fuscus distinctus							
Cyclops dybowskii.....	18 som	9♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops dybowskii.....		9♀			Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Cyclops fuscus.....	14 som	7♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops fuscus.....	7 oog	7♀			Ditetrads	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops fuscus.....	14					Chambers, '12	Univ. Toronto Studies 14, p. 1
Cyclops fuscus var. distinctus (possibly hybrid fuscus x albidus)...	11 som	6♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops fuscus var. distinctus.....		6, 7♀			5 or 6 ditetrads + 1 heterochromosome	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops fuscus var. distinctus.....	11 prim. germ cells 11 cl					Amma, '11	Arch. Zellf., 6, p. 497
Cyclops gracilis.....	6 som	3♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops gracilis.....	6 cl	3♀	3♀	3♂ pron 3♀	Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Cyclops insignis.....	22 som	11♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops insignis.....		11♀			Ditetrads	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops insignis.....	22 prim. germ cells					Amma, '11	Arch. Zellf., 6, p. 497
Cyclops leuckarti.....	14 som	7♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449

Cyclops leuckarti.....		7♀			Ditetrads	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops modestus.....	8					Chambers, '12	Univ. Toronto Studies 14, p. 1
Cyclops phaleratus.....	13 som	7♀			6 ditetrads + 1 heterochromosome	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops phaleratus.....	7 Keimpolster	7♀	6, 7♀	6, 7♀	6 ditetrads + 1 heterochrom. Latter to pole in 1st	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Cyclops prasinus.....	11 som	6♀			5 ditetrads + 1 heterochromosome	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops prasinus.....		6♀			5 ditetrads + 1 heterochromosome	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops serrulatus.....	14 som	7♀		6, 7♀	6 ditetrads + 1 m-chrom. Latter to either pole in 2nd	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops serrulatus.....		8♀			6 ditetrads + 2 heterochroms	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops signatus.....	8 oog 8 cl (double)	8♀ (= 16 el)	4♀ (= 8 el)	4♂ 4♀		Häcker, '90 Häcker, '92	Zool. Anz., 13, p. 551 Zool. Jahrb., 5, p. 211
Cyclops strenuus.....	8 oog 8 cl (double)	8♀ (= 16 el)	4♀ (= 8 el)	4♂ 4♀		Häcker, '90 Häcker, '92 Häcker, '93 Häcker, '94	Zool. Anz., 13, p. 551 Zool. Jahrb., 5, p. 211 Arch. mikr. Anat., 41, p. 452 Arch. mikr. Anat., 43, p. 759
Cyclops strenuus.....	22–24 cl	11–12♀		11–12♂ pron 11–12♀ pron		Rückert, '94 Rückert, '95	Anat. Hefte, 4, p.261 Arch. mikr. Anat., 45 p. 339
Cyclops strenuus.....	ca 20 spg	11♀	11♀			Lerat, '05	La Cellule, 22, p. 161
Cyclops strenuus.....	22 som	11♀ 14♀			Ditetrads. May be 2 varieties	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops strenuus.....		11♀			Ditetrads	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops strenuus.....	22 cl					Amma, '11	Arch. Zellf., 6, p. 497
Cyclops vernalis.....	10 som	5♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops vernalis.....		5. 6♀			5 ditetrads or same + 1 heterochrom	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Cyclops viridis = brevicornis	12 cl (double) = 24	12♀ (= 24)	6 pairs ♀ (= 12)	6♂ pron (= 12) 6♀		Häcker, '95	Arch. mikr. Anat., 46, p. 579
						Häcker '97	Biol. Centralb., 17, p. 721
						Häcker, '03	Jen. Zeits., 30, p. 297
						Häcker, '04	Zool. Jahrb., 7, suppl., p. 161
Cyclops viridis	12 cl 14 cl				2 varieties	Schiller, '08	Zool. Anz., 32, p. 616
Cyclops viridis	12 som	6♀			Ditetrads	Braun, '09	Arch. Zellf., 3, p. 449
Cyclops viridis	12 spg 12 oog					Krimmel, '10	Zool. Anz., 35, p. 778
Cyclops viridis		6♀			Ditetrads	Matscheck, '10	Arch. Zellf., 5, p. 36
Cyclops viridis	12 cl	6♀			Biserial	Amma, '11	Arch. Zellf., 6, p. 497
Cyclops viridis	12					Chambers, '12	Univ. Toronto Studies 14, p. 1
Cyclops viridis var. americanus	10 spg 10 oog 10 som	5♂ 5♀	5♂ 5♀	5♂ 5♀	Biserial	Chambers, '12	Univ. Toronto Studies, 14, p. 1
Cyclops viridis var. brevispinosus	4 oog	2♀	2♀		Biserial	Chambers, '12	Univ. Toronto Studies, 14, p. 1
Cyclops viridis var. parcus	6 oog	3♀	3♀	3♂ pron 3♀	Biserial	Chambers, '12	Univ. Toronto Studies, 14, p. 1
Diaptomus castor		15♀	17♀		1 heterochrom = 3 elements, are separate in 2nd and divide in both divisions	Häcker and Matscheck, '08 Matscheck, '09 Matscheck, '10	Verh. deutsch. Zool. Ges., 18, p. 110 Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36

Diaptomus castor.....	34 cl			17♂ pron 17♀ pron		Amma, '11	Arch. Zellf., 6, p. 497
Diaptomus coeruleus.....		14♀				Häcker and Matscheck, '08 Matscheck, '09	Verh. deutsch. Zool. Ges., 18, p. 110 Zool. Anz., 34, p. 42
Diaptomus coeruleus.....	28 spg (14–28) 28 oog 28 som (14–28)					Krimmel, '10	Zool. Anz., 35, p. 778
Diaptomus coeruleus.....	28 cl			14♂ pron 14♀ pron		Amma, '11	Arch. Zellf., 6, p. 497
Diaptomus denticornis...	32 cl					Häcker, '03	Jen. Zeits., 30, p. 297
Diaptomus denticornis...		17♀			Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Diaptomus gracilis.....	32 cl	16♀				Rückert, '94	Anat. Hefte 4, p. 261
Diaptomus gracilis.....		17♀			Ditetrads	Häcker and Matscheck, '08 Matscheck, '09	Verh. deutsch. Zool. Ges., 18, p. 110 Zool. Anz., 34, p. 42
Diaptomus laciniatus.....		16♀			Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Diaptomus salinus.....		17♀			Ditetrads	Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Diaptomus sp? (Japanese).....	8 spg 8 oog 8 cl	8♂ 8♀	8♂ 8♀	4♂ 4♀	4 chroms to each pole in 2nd	Ishikawa, '91	Coll. Sci. Imp. Univ. Japan, 5, p. 1
Euchaeta marina.....		12♀ (= 48 el)	12♀ (= 24 el)	12♀		Vom Rath, '95	Arch. mikr. Anat., 46, p. 168
Euchaeta marina.....		17♀				Kornhauser, '15	Arch. Zellf., 13, p. 399
Hersilia apodiformis.....	24 spg 24 oog 24 cl	12♂ 12♀	12♂		Sometimes 13 in 1st; one pair fails to conjugate	Kornhauser '15	Arch. Zellf., 13, p. 399
Heterocope robusta.....		16♀				Rückert, '94	Anat. Hefte, 4, p. 261
Heterocope saliens.....		16♀				Matscheck, '09 Matscheck, '10	Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36
Heterocope weismanni....		16♀				Häcker and Matscheck, '08 Matscheck, '09 Matscheck, '10	Verh. deutsch. Zool. Ges., 18, p. 110 Zool. Anz., 34, p. 42 Arch. Zellf., 5, p. 36

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Laemargus muricatus.....	16 spg 16? oog	8♂	8♂	8♂		McClendon, '06	Biol. Bull., 12, p. 37
Lichomolgus forficula.....		10♀				Kornhauser, '15	Arch. Zellf., 13, p. 399
Mytilicola intestinalis.....	8 spg 8 oog	16♂	8♂	4♂		Steuer, '03	Arb. Zool. Inst. Wien, 15, p. 1
Orthagoriscicola muricata	16 oog	8♀				McClendon, '06 McClendon, '10	Biol. Bull., 12, p. 37 Arch. Zellf., 5, p. 229
Nitocra hibernica.....		8♀ (double)				Krüger, '11	Arch. Zellf., 6, p. 165
Pandarus sinuatus.....	16 spg 16 oog	8♂ 8♀	8♀ 8♀	8♂		McClendon, '06 McClendon, '07 McClendon, '10	Biol. Bull., 12, pp. 37 and 53 Biol. Bull., 13, p. 114 Arch. Zellf., 5, p. 229
Paracalanus parvus.....		6♀				Moroff, '09	Arch. Zellf., 2, p. 432
Sapphirina sp?.....	16 spg					Kornhauser, '15	Arch. Zellf., 13, p. 399
c. Ostracoda							
Cypris fuscata.....	24 cl	24♀			Pa egg; 1 p.b., no reduction	Schleip '09	Arch. Zellf., 2, p. 390
Cypris incongruens.....	12 pa cl	12♀			Pa; 1 p.b.	Woltereck, '98	Zeit. wiss. Zool., 64, p 596
Cypris incongruens.....	12 pa cl	12♀			Pa; 1 p.b., no reduction. No X	Müller-Calé, '13	Zool. Jahrb., 36, p. 113.
Cypris reptans.....	12 pa cl	12♀			Pa; 1 p.b.	Woltereck, '98	Zeit. wiss. Zool., 64, p. 596
Notodromas monacha = Cyprois monacha.....	13–16 oog 16 cl	8♀	8♀	8♂ 8♀		Schleip, '09	Arch. Zellf., 2, p. 390
Notodromas monacha....	16 cl	8♂	8♂	8♂		Schmalz, '11 Schmalz, '12	Zool. Anz., 37, p. 462 Arch. Zellf., 8, p. 407

d. Phyllopoda

1. Cladocera

Bythotrephes longimanus	4? cl			2?♀		Weismann and Ishikawa, '89	Zool. Jahrb., 4, p. 155
Daphnia pulex	8 spg 8 som 8 cl	8♀			Pa egg; 1 p.b., no reduction	Kühn, '08	Arch. Zellf., 1, p. 538
Daphnia pulex	8–10 spg 8–10 som	4–5♂	4–5♂			Taylor, '14	Zool. Anz., 45, p. 21
Moina paradoxa Moina rectirostris		4♀	4♀		Winter egg	Weismann and Ishikawa, '89	Zool. Jahrb., 4, p. 155
Polyphemus pediculus	8 spg 8 som 8 cl	8♀				Kühn, '08	Arch. Zellf., 1, p. 538
Simocephalus vetulus		8♂	ca 8♂		No X	Chambers, '13	Biol. Bull., 25, p. 134

2. Euphyllopoda

Apus	1 oog				Monomeric division	Moore, '93	Q. J. M. S., 35, p. 259
Artemia salina		30–40♀			Pa; 1 p.b.	Weismann and Ishikawa, '88	Zool. Jahrb., 3, p. 575
Artemia salina	84 cl 168 cl	84♀	84♀	84♀	Pa; pronucleus may be fertilized by 2nd p.b. (= 168)	Brauer, '93 Brauer, '94	Zool. Anz., 16, p. 138 Arch. mikr. Anat., 43, p. 162
Artemia salina		84♀		84♀	Pa; 1 p.b.	Petrunkewitsch, '02	Anat. Anz., 21, p. 256
Artemia salina	80–90 oog (= 84?) 70–90 som	84♀				Fries, '09	Arch. Zellf., 4, p. 44
Artemia salina var. bivalens parthenogenetica di Capo d'Istria	84 cl	84♀			Pa: 1 p.b.	Artom, '08 Artom, '11 Artom, '11 Artom, '12	Biologica 1, pp. 5 and 495 Arch. Zellf., 7, p. 277 Biol. Centralb., 31, p. 104 Arch. Zellf., 9, p. 87
Artemia salina var. univalens sessuata di Cagliari	42 cl	21♀	21♀		Sexual	Artom, '08 Artom, '11 Artom, '11 Artom, '12	Biologica 1, pp. 5 and 495 Arch. Zellf., 7, p. 277 Biol. Centralb., 31, p. 104 Arch. Zellf., 9, p. 87

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Branchipus		10♂ (double)	10♂ (double)			Moore, '93	Q. J. M. S., 35, p. 259
Branchipus grubii	24 oog 24 cl	12♀	12♀	12♀		Brauer, '92	Abh. Akad. Wiss. Berlin, Physik. Abt., '92, p. 1
						Brauer, '94	Arch. mikr. Anat., 43, p. 162
Branchipus grubii	22–24 oog 24 som	12♀		12♂ pron 12♀ pron		Fries, '09	Arch. Zellf., 4, p. 44
2. Malacostraca a. Arthrostraca 1. Amphipoda							
Talorchestia longicornis		18♂				Nichols, '09	Jour. Morph., 20, p. 461
2. Isopoda							
Asellus aquaticus	20–30 spg	8–10♂				Carnoy, '85	La Cellule, 1, p. 189
Idotea irrorata		28♂				Nichols, '09	Jour. Morph., 20, p. 461
Oniscus asellus		16♂				Nichols, '02	Proc. Amer. Phil. Soc., 41, p. 77
						Nichols, '09	Jour. Morph., 20, p. 461
b. Decapoda 1. Brachyura							
Carcinus menas		30–40♂				Carnoy, '85	La Cellule, 1, p. 189
Menippe mercenaria	51–80 spg		25–28♀			Binford, '13	Jour. Morph., 24, p. 147
2. Macrura							
Astacus fluviatilis		ca 58♂				Prowazek, '02	Zeits. wiss. Zool., 71, p. 445
Cambarus immunis?		104♂	104♂		A clump of 8 chroms	Fasten, '14	Jour. Morph., 25, p. 587

Cambarus virilis	200 spg	100♂	100♂			Fasten, '14	Jour. Morph., 25, p. 587
Crangon cataphractus		40–44♂				Carnoy, '85	La Cellule, 1, p. 189
Eupagurus prideauxii		12♀	12♀			Weismann and Ishikawa, '88	Zool. Jahrb., 3, p. 575
Euphasidae	38 cl					Taube, '09	Zeits. wiss. Zool., 92, p. 427
Hippa talpoides		60♂				Nichols, '09	Jour. Morph., 20, p. 461
Homarus		18♂				Labbé, '04	C. R. Acad. Sci. Paris, 138, p. 96
e. Stomatopoda							
Squilla mantis		20–24♂				Carnoy, '85	La Cellule, 1, p. 189
c. Insecta							
1. Aptera							
a. Collembola							
Anurida maritima	8 oog 8? cl				Unfavorable for maturation	Claypole, '98	Jour. Morph., 14, p. 219
Orchesella villosa		6?♀				Lécaillon, '01	Arch. d'Anat. mikr., 4, p. 471
Podura aquatica	8 oog					Willem, '00	Mém. couronées Acad. roy. Belgique 58, no. 3, p. 1
2. Coleoptera							
a. Buprestidae							
Euchroma gigantea		13♂			XY to poles in 1st	Nichols, '10	Biol. Bull., 19, p. 167
Spruce-borer (unidentified)		10♂	10♂		XY to poles in 1st	Stevens, '06	Carnegie Inst. Pub., 36 II, p. 33
Spruce-borer (another sp)		11♂				Stevens,' 06	Carnegie Inst. Pub., 36 II, p. 33

II. ARTHROPODA—Continued

b. Carabidae

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Anomoglossus emarginatus		19♂	18, 19♂	18, 19♂	X to pole in 1st	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Chlaenius aestivus		17♂			XY to poles in 1st	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Chlaenius pennsylvanicus		10♂			XY to poles in 1st	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Galerita bicolor	30 spg				XY	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33

c. Cerambycidae

Cylene robinia	20 spg	10♂			XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Tetraopes tetraophthalmus	20 spg	10♂			XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101

d. Chrysomelidae

Adimonia tanaceti		12 (at least)♀				Henking, '92	Zeit. wiss. Zool., 54, p. 1
Agelastica alni	24–25 spg 24–30 cl	ca. 12♂ (= 16 -17 el) 12♀	ca. 12♂ (= 16 -17 el) 12♀			Henking, '92	Zeit. wiss. Zool., 54, p. 1
Blepharida rhois		16♂	16♂	16♂	XY to poles in 1st	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Chelymorpha argus	22 spg 22♀ som	11♂	11♂		XY to poles in 1st XX in ♀ diploid	Stevens, '06	Carnegie Inst. Pub. 36, II. p. 33

e. Cincindellidae							
Cincindella primeriana..	20 spg	10♂	10♂		XY (tripartite) to poles in 1st	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Cincindella vulgaris.....	22 spg				Trilobed XY in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
f. Coccinellidae							
Adalia bipunctata.....	20 spg	10♂	10♂		XY to poles in 1st	Stevens, '06	Carnegie, Inst. Pub., 36, II, p. 33
Epilachna borealis.....	18 spg	9♂	9♂		XY to poles in 1st	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Coccinellidae, (a number of sp).....	20 spg	10♂	10♂		XY to poles in 1st	Stevens, 09	Jour. Exp. Zool., 6, p. 101
g. Dytiscidae							
Colymbetes fuscus.....	35–37 oog					Gunthert, '10	Zool. Jahrb., 30, p. 301
Cybister roeselii.....	ca. 22 spg	12?♂(11–15)	12♂	6♂		Voinov, '03	Arch. Zool. exp. et gen. ser. IV, vol. 1, p. 173
Dytiscus.....	ca 40 oog ca. 40♀ som					Giardina, '01	Intern. Monats. Anat. u. Phys., 18, p. 417
Dytiscus circumcinctus...	38 spg	19♂	19♂	19♂		Schäfer, '07	Zool. Jahrb., 23, p. 535
Dytiscus marginalis.....	ca. 40 spg (36–41)				No X	Henderson, '07	Zeit. wiss. Zool., 87, p. 644
Dytiscus marginalis.....	38 spg	19♂	19♂	19♂	X divides in both divisions. 2X in spg.	Schäfer, '07	Zool. Jahrb., 23, p. 535
Dytiscus marginalis.....	40 oog					Debaisieux, '09	La Cellule, 25, p. 207
h. Elateridae							
Elater sp? I.....	19 spg 20 oog	10♂			X to pole in 1st	Stevens, '06	Carnegie Inst., Pub., 36, II, p. 33
Elater sp? II.....	19 spg				X	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Limoneus griseus.....	17 spg	9♂	8, 9♂	8, 9♂	X to pole in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101

II. ARTHROPODA—Continued

i. Hydrophilidae

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Hydrophilus piceus.....		10–12♂	5–6♂			Carnoy, '85	La Cellule I, p. 189
Hydrophilus piceus.....	16 spg	16♂ (= 32 el)	8♂ (= 16 el)	8♂	Tetrads and dyads = separate elements	Vom Rath, '92	Arch. mikr. Anat., 40, p. 102
Hydrophilus piceus.....	30 som	15♂(gemini)	15♂			Arnold, '08	Arch. Zellf., 2, p. 181
Chrysochus auratus.....		13♂			XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Chrysomela similis.....		12♂	11, 12♂	11, 12♂	X to pole in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Coptocycla auriehalcea...	22 spg	11♂	11♂	11♂	XY to poles in 1st	Nowlin, .06	Jour. Exp. Zool., 3,p. 583
Coptocycla clavata.....	18 spg				XY	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Coptocycla guttata.....	18 spg	9♂	9♂	9♂	XY to poles in 1st	Nowlin, '06	Jour. Exp. Zool., 3, p. 583
Crioceris asparagi.....		8♀	8♀			Henking, '92	Zeit. wiss. Zool., 54, p. 1
Diabrotica 12-punctata. Diabrotica soror.....	19 spg	10♂	9, 10♂	9, 10♂	X to pole in 1st		
	20 spg	11♂	9, 10, 11♂	9, 10, 11♂	X; S to pole in 1st or 2nd		
	21 spg	12♂	9–12♂	9–12♂	X; 2S		
		13♂	9–13♂		X; 3S		
			9–14♂		X; 4S	Stevens, '08	Jour. Exp. Zool., 5, p. 453
Diabrotica vittata.....	21 spg	11♂	10, 11♂	10, 11♂	X to pole in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 453
Diabrotica vittata.....	21, 22 som					Hoy, '14	Biol. Bull., 27, p. 45
Donacia (sericea?).....			15♀			Henking, '92	Zeit. wiss. Zool., 54, p. 1
Doryphora clivicolis.....		17♂	17♂		XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Doryphora decemlineata.	36 spg	18♂	18♂			Stevens, '06	Carnegie Inst. Pub 36, II, p. 33

Haltica chalybea.....	22 spg	11♂			XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Lema trilineata	32 spg		16♂		XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Leptinotarsa signaticolis..		17♂	16, 17♂	16, 18♂	Bivalent X to pole in 1st. Parts separate in 2nd anaph.	Wieman, '10	Jour. Morph., 21, p. 135
Lina laponica.....		17♂			XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Odontota dorsalis.....	16 spg 16♂ som	8♂	8♂		XY to poles in 1st. One testis, Y = 2 elements, 17 spg., 8, 9 2nd cyte	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Trirhabda canadense....	30 spg 30♀ som	15♂	15♂		XY to poles in 1st XX in ♀ diploid	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Trirhabda virgata.....	28 spg, 28♂ som 28♀ som	14♂	14♂		XY to poles in 1st XX in ♀ diploid	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
j. Lampyridae							
Ellychnia corrusca.....	19 spg				X	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 36, II, p. 33 Jour. Exp. Zool., 6, p. 101
Lampyrus splendidula....		6–8♀	6–8♀			Henking, '92	Zeit. wiss. Zool. 54, p. 1
Photinus consanguineus Photinus pennsylvanicus.....	19 spg 20 oog 19♂ som	10♂	10♂	9, 10♂	X to pole in 2nd	Stevens, '09	Jour. Exp. Zool., 6, p. 101
k. Melandryidae							
Penthe obliquata.....	16 spg		8♂		XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
l. Meloidea							
Epicauta cinerea..... Epicauta pennsylvanica.....	20 spg	10♂	10♂		XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101

II. ARTHROPODA—Continued

m. Scarabaeidae

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Euphoria inda	20 spg	10♂	10♂	10♂	XY to poles in 1st	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Oryctes nasicornis	12 spg	6♂	6♂	6♂		Prowazek, '02	Arb. Zool. Inst. Wien, 13, p. 223
n. Silphidae							
Necrophorus sayi	13 spg	7♂	6, 7♂	6, 7♂	X to pole in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Silpha americana	40 spg	20♂	20♂		XY to poles in 1st	Stevens. '06	Carnegie Inst. Pub., 36 II, p. 33
Silpha carinata	32 spg	16♂ (= 64 el)	16♂ (= 32 el)	16♂		Holmgren, '02	Anat. Anz., 22, p. 194
o. Staphylinidae							
Listotrophus cingulatus	26 spg	13♂	13♂		XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
Rove-beetle, brown	28 spg	14♂	14♂			Stevens, '09	Jour. Exp. Zool., 6, p. 101
Staphylinus violaceus		22♂	22♂		XY to poles in 1st	Stevens, '09	Jour. Exp. Zool., 6, p. 101
p. Tenebrionidae							
Blaps lusitanica	35 spg (33 in some)	17♂ (16 in some)	17, 17 + X♂ (16 in some)		X to pole in 1st. X attached to another pair in 1st and 2nd	Fernández-Nonidez, '14	Trab. Mus. Nac. de C. Nat. de Madrid, Ser., Zool., No. 18, p. 1
Tenebrio molitor	20 spg 20 oog 20♂ spg 20♀ som	10♂	10♂	10♂	XY to poles in 1st XY in spg XX in oog	Stevens, '05	Carnegie Inst. Pub, 36, p. 1

3. Diptera

a. Anthomyiidae

Phorbia brassica.....		6♂			XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359

b. Cecidomyiidae

Miastor americana.....		20–24♀			Paedogenetic. One polar body	Hegner, '14	Jour. Morph., 25, p. 375
Miastor metraloas.....	20–24 oog 20–24 early cl 10–11 late cl	20–24♀			Paedogenetic. One polar body	Kahle, '08	Zoologica, 21, p. 1

c. Chironomidae

Chironomus confinis.... Chironomus riparius...		4–8♀				Hasper, '11	Zool. Jahrb., 31, p. 543

d. Culicidae

Anopheles punctipennis..	6 spg 6 oog	3♂	3♂	3♂	XY in ♂ attached to another pair. To poles in 1st. XX in ♀ attached to another pair.	Stevens, '11	Biol. Bull., 20, p. 109
Anopheles sp?.....		6♂	6♂		XY to poles in 1st	Stevens, '11	Biol. Bull., 20, p. 109
Culex pipiens.....	6 spg 6 oog	3♂	3♂	3♂	No XY. (= pungens? '10)	Stevens, '10 Stevens, '11	Jour. Exp. Zool., 8, p. 207 Biol. Bull., 20, p. 109
Culex pipiens.....	6 spg (= 3 pairs)	3♂	3♂			Lomen, '14	Jen. Zeits., 45, p. 567
Culex pipiens.....	3 spg 3 and 6 oog 3 som	3♂	3♂	3♂		Taylor, '14	Q. J. M. S., 60, p. 377
Culex tarsalis.....	6 spg 6 oog	3♂	3♂	3♂	No XY	Stevens, '11	Biol. Bull., 20, p. 109
Theobaldia incidens	6 spg 6 oog	3♂	3♂		No XY	Stevens, '11	Biol. Bull., 20, p. 109

II. ARTHROPODA—Continued

e. Muscidae

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Calliphora vomitoria.....	12 spg 12 oog	6♂	6♂	6♂	XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359
Lucilia caesar.....		6♂	6♂		XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359
Musca domestica.....	12 spg 12 oog	6♂	6♂	6♂	XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359

f. Muscidae acalyptratae

Drosophila amoena.....	8 spg 8 oog		4♂		XY in ♂ diploid XX in ♀ diploid	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila ampelophila..	8 spg 8 oog 8 cl	4♂	4♂	4♂	XY to poles in 1st X may be of two parts	Stevens, '08	Jour. Exp. Zool., 5, p. 359
Drosophila ampelophila..	8 oog				XX in ♀ dipleid	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila funebris.....	10 or 12 oog				Pair m-chroms, present (= 12) or absent (= 10)	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila quinaria.....	8 oog				XX in ♀ diploid	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila repleta.....	12 oog				XX in ♀ diploid	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila tripunctata...	8 oog				XX in ♀ diploid	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila 2 sp?.....	8 oog				XX in ♀ diploid	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila 2 sp? (A and B).....	12 oog				XX in ♀ diploid	Metz, '14	Jour. Exp. Zool., 17, p. 45
Drosophila sp? (C).....	10 oog		5♂		XX in ♀ diploid	Metz, '14	Jour. Exp. Zool., 17, p. 45

Scatophaga pallida.....	12 spg 12 oog	6♂	6♂	6♂	XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359
Tetanocera sparsa.....	12 spg 12 oog	6♂	6♂	6♂	XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359
g. Sarcophagidae							
Sarcophaga sarraciniae....	12 spg 12♀ som	6♂	6♂	6♂	XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359
h. Syrphidae							
Eristalis tenax.....	12 spg 12♂ som 12♀ som	6♂	6♂	6♂	XY to poles in 1st	Stevens, '08	Jour. Exp. Zool., 5, p. 359
4. Hemiptera a. Heteroptera 1. Belostomidae							
Zaitha sp? (fluminea or aurantiacum).....	24 spg	13♂	12♂	12♂	XY to poles in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
2. Capsidae							
Calocoris rapidus.....	30 spg	16♂	15, 16♂		2X, one to pole in 1st, other in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Leptoterna dolabrata.....		17♂				Montgomery, '01	Trans. Amer. Phil. Soc., 20, p. 154
Lygus pratensis.....	prob. 35 spg	19♂	17, 18♂	17, 18♂	X to pole in 1st, XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Proc. Acad. Nat. Sci. Phila., 53, p. 261 Trans. Amer. Phil. Soc., 21, p. 97
Poecilocapsus goniphorus.		18♂	17♂	17♂	XY to poles in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p 97
Poecilocapsus lineatus...		18♂				Montgomery, '01	Trans. Amer. Phil. Soc., 20, p. 154

II. ARTHROPODA—Continued

3. Coreidae

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Alydus eurinus	13 spg	7♂	7♂	6, 7♂	X to pole in 2nd	Montgomery, '01 Montgomery, '04 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Biol. Bull., 6, p. 137 Trans. Amer. Phil. Soc., 21, p. 97
Alydus pilosulus	13 spg	7♂	7♂	6, 7♂	X to pole in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Alydus pilosulus	13 spg 14 oog	7♂	7♂	6, 7♂	X to pole in 2nd	Wilson, '05	Jour. Exp. Zool., 2, p. 507; 3, p. 1
Anasa armigera	21 spg	11♂			X to pole in 2nd From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Anasa armigera	22 oog				XX in oog	Wilson, '09	Jour. Exp. Zool., 6, p. 69
Anasa tristis	22 spg	11♂	11♂	10, 11♂	Pair small chroms. in spg; to pole in 2nd and degenerate	Paulmier, '98 Paulmier, '99	Anat. Anz., 14, p. 514 Jour. Morph., 15 suppl. p. 223
Anasa tristis	21 spg 22 oog	11♂	11♂	10, 11♂	X to pole in 2nd. From correction in '06	Montgomery, '01 Montgomery, '04 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Biol. Bull., 6, p. 137 Trans. Amer. Phil. Soc., 21, p. 97
Anasa tristis	21 spg 22 oog	11♂	11♂	10, 11♂	X to pole in 2nd	Wilson, '05, '06 Wilson, '07 Wilson, '11	Jour. Exp. Zool., 2, pp. 371 and 507; 3, p. 1 Science, 25, no. 631, p. 191 Jour. Morph., 22, p. 71
Anasa tristis	22 spg	11♂	11♂	11♂	No accessory but nucleolus	Foot and Strobell, '07 Foot and Strobell, '07	Biol. Bull., 12, p. 119 Amer. Jour. Anat., 7, p. 279

Anasa tristis	21 spg			10, 11♂	X to pole in 2nd	Lefevre and McGill, '08	Amer. Jour. Anat., 7, p. 469
Anasa tristis	21 spg, 21♂ cl 22 oog, 22♀ cl (One cl 23)	11♀	11♀		X in ♂ diploid XX in ♀ diploid	Morrill '10	Biol. Bull., 19, p. 79
Anasa tristis	21 spg 22 oog	11♂ (12 in two cases)	11♂		X to pole in 2nd	McClung and Pinney, '10	Kansas Univ. Sci. Bull., 5, p. 349
Anasa tristis	21, 22 som					Hoy, '14	Biol. Bull., 27, p. 45
Anasa sp? (from California)	21 spg 22 oog	11♂			X From correction in '06	Montgomery, '01 Montgomery, '04 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Biol. Bull., 6, p. 137 Trans. Amer. Phil. Soc., 21, p. 97
Archimerus alternatus (= calcarator?)	15 spg 16 oog 15♂ cl 16♀ cl	8♂ 8♀	7, 8♂ 8♀	7, 8♂ 8♀	X to pole in 1st (♂) X in ♂ diploid. XX in ♀ diploid.	Morrill, '10	Biol. Bull., 19, p. 79
Archimerus calcarator	15 spg 16 oog	8♂	7, 8♂	7, 8♂	X to pole in 1st	Wilson, '05 Wilson, '09	Jour. Exp. Zool., 2, pp. 371 and 507 Jour. Exp. Zool., 6, p. 69
Catorintha	25 spg				X	Wilson, '07	Science, 25, no. 631, p. 191
Chariesterus antennator		13♂	13♂	12, 13♂	X to pole in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Chariesterus antennator ?	21 spg				X to pole in 2nd. Species may be wrongly identified, labelled by Paulmier	Wilson, '05	Jour. Exp. Zool., 2, pp. 371 and 507
Chariesterus antennator	25 spg 26 oog				X in spg. XX in oog	Wilson, '09	Jour. Exp. Zool., 6, p. 69
Chelinidea vittigera	21 spg				X	Wilson, '07	Science, 25, no. 631, p. 191
Chelinidea vittigera	21 spg 22 oog 21♂ cl 22♀ cl (one spg 22)				X in ♂ diploid XX in ♀ diploid	Morrill, '10	Biol. Bull., 19, p. 79

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Corizus alternatus.....	13 spg	7♂ (8 if 2 univalent)	7♂	6, 7♂	X to pole in 2nd. From correction in '06	Montgomery, '01 Montgomery, '04 Montgomery, '06	Proc. Acad. Nat. Sci. Phila., 53, p. 261 Biol. Bull., 6, p. 137 Trans. Amer. Phil. Soc., 21, p. 97
Corizus lateralis.....		7♂	7♂	6, 7♂	X to pole in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Corynocoris distinctus....	25 spg 26 oog				X in spg. XX in oog	Wilson, '09	Jour. Exp. Zool., 6, p. 69
Euthoctha galeator.....	21 spg 22 oog				X in spg. XX in oog	Wilson, '07 Wilson, '09	Science, 25, no. 631, p. 191 Jour. Exp. Zool., 6, p. 69
Harmostes reflexulus.....	13 spg	7♂ (8 if 2 univalent)	7♂	6, 7♂	X to pole in 2nd	Montgomery, '01 Montgomery, '01 Montgomery, '04 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Proc. Acad. Sci. Phila., 53, p. 261 Biol. Bull., 6, p. 137 Trans. Amer. Phil. Soc., 21, p. 97
Harmostes reflexulus.....	13 spg 14 oog				X to pole in 2nd	Wilson, '06	Jour. Exp. Zool., 3, p. 1
Leptocoris trivittatus.....	13 spg 14 oog				X in spg. XX in oog	Wilson, '07 Wilson, '09	Science, 25, no. 631, p. 191 Jour. Exp. Zool., 6, p. 69
Leptoglossus phyllopus...	21 spg 22 oog	11♂			X to pole in 2nd	Wilson, '07 Wilson, '09 Wilson, '11	Science, 25, no. 631, p. 191 Jour. Exp. Zool., 6, p. 69 Jour. Morph., 22, p. 71
Margus inconspicuus.....	23 spg 24 oog				X in spg. XX in oog	Wilson, '07 Wilson, '09	Science, 25, no. 631, p. 191 Jour. Exp. Zool., 6, p. 69

Metapodius femoratus	22 spg	11♂ (1 triad)	11, 12♂	10, 11, 12♂	X to pole in 2nd. 2m to one pole, 1 m to other in 1st	Wilson, '07 Wilson, '09 Wilson, '10	Biol. Bull., 12, p. 303 Jour. Exp. Zool., 6, p. 147 Jour. Exp. Zool., 9, p. 53
	22 spg 22 oog	12♂	11♂	11♂	XY to poles in 2nd		
	23 spg 23 oog	13♂	11, 12♂	11, 12♂	XY and S to poles in 2nd. S may be attached to X or Y (= 11) or free (= 12) in 2nd metaphase		
	24 spg 24 oog	14♂	11, 12♂	11, 12, 13♂	XY and 2S (as above)		
	26 spg 26 oog	16♂	11–15♂	11–15♂	XY and 4S (as above)		
	28 oog				XY and 6S? (as above)		
Metapodiuos granulosus	22 spg 22 oog	12♂	11♂	11♂	XY to poles in 1st	Wilson, '07 Wilson, '09	Biol. Bull., 12, p. 303 Jour. Exp. Zool., 6, p. 147
	23 spg 23 oog	13♂	11, 12♂	11, 12♂	XY and S (as in M. femoratus)		
	24 spg 24 oog	14♂	11, 12♂	11, 12, 13♂	XY and 2S (as in M femoratus)		
	25 spg 25 oog	15♂	11♂		XY and 3S (as in M. femoratus)		
	26 spg 26 oog	16♂	11–15♂	11–15♂	XY and 4S (as in M. femoratus)		
		17♂	11♂		XY and 5S (as in M. femoratus)		
Metapodius terminalis...	21 spg	11♂	11♂	10, 11♂	X to pole in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Metapodius terminalis..	21 spg	11♂	11♂	10, 11♂	X to pole in 2nd	Wilson, '07 Wilson, '09	Biol. Bull., 12, p. 303 Jour. Exp. Zool., 6, p. 147
	22 spg 22 oog	12♂	11♂	11♂	XY to poles in 2nd		
	23 spg 23 oog	13♂	11, 12♂	11, 12♂	XY and S (as in M. femoratus)		
	24 spg 24 oog	14♂	11, 12♂	11, 12, 13♂	XY and 2 S (as in M. femoratus)		

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Metapodius terminalis..	25 spg 25 oog	15♂	11♂		XY and 3S (as in M. femoratus)		
	26 spg 26 oog	16♂	11–15♂	11–15♂	XY and 4S (as in M. femoratus)		
Narnia.....	21 spg					Wilson, '07	Science, 25, no. 631, p. 191
Pachylis gigas.....	15 spg 16 oog	8♂			X in spg. XX in oog	Wilson, '07	Science, 25, no. 631, p. 191
						Wilson, '09	Jour. Exp. Zool., 6, p. 69
						Wilson, '11	Jour. Morph., 22, p. 71
Protenor belfragei.....	13 spg	7♂	7♂	6, 7♂	X to pole in 2nd	Montgomery, '01	Trans. Amer. Phil., Soc., 20, p. 154
						Montgomery, '04	Biol. Bull., 6, p. 137
						Montgomery, '06	Trans. Amer. Phil. Soc., 21, p. 97
Protenor belfragei.....	13 spg 14 oog	7♂	7♂	6, 7♂	X to pole in 2nd	Wilson, '05 , '06	Jour. Exp. Zool., 2, p. 507; 3, p. 1
						Wilson, '11	Jour. Morph., 22, p. 71
Protenor belfragei.....	13 spg 14 oog 13♂ cl 14♀ cl	7♀		7 pron.	X in ♂ diploid. XX in ♀ diploid	Morrill, '10	Biol. Bull., 19, p. 79
Syromastes marginatus...	22 spg 22♀ som	11♂	10♂ (= 11, X a pole in metaphase)	10, 11♂	Bivalent X to pole in 2nd. Sperm with 10 not functional	Gross, '04	Verh. deutsch. Zool. Gesel., '04, p. 180
						Gross, '04	Zool. Jahrb., 20, p. 439
						Gross, '12	Zool. Jahrb., Abt. f. Zool., 32, p. 99
Syromastes marginatus...	22 spg 24 oog	11♂	10♂ (= 12, X at pole in metaphase)	10, 12♂	Double X to pole in 2nd. X = 2 unequal parts, united in 1st metaphase	Wilson, '09	Jour. Exp. Zool., 6, p. 69
						Wilson, '09	Biol. Bull., 16, p. 199
4. Corixidae							
Corixa verticalis.....		12♂				Montgomery, '01	Proc. Acad. Nat. Sci. Phila., 53, p. 261

5. Galgulidae							
Galgulus oculatus (= Gelastocoris).....	35 spg 38 oog 38♀ som	20♂	20♂	16, 19♂	XY to poles in 2nd X = 4 elements	Payne, '09	Biol. Bull., 16, p. 119
6. Hydrometridae							
Hydrometra lacustris.....	11 spg	12♂	12♂		Large chrom of spg = 2 in spc.	Wilke, '07 Wilke, '13	Jen. Zeits., 35, p. 669 Arch. Zellf., 10, p. 203
Hydrometra paludum....	10–15 spg (prob. 12)	12♂ (few with 13 and 14)	12♂		X? divides in both divisions	Wilke, '12 Wilke' 13	Zool. Anz., 40, p. 216 Arch. Zellf., 10, p. 203
Hygotrechus sp?.....	21 spg	11♂	11♂	10, 11♂	X to pole in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Limnotrechus marginatus		11♂	11♂		X to pole in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
7. Lygaeidae							
Cymus angustatus.....			14♂		XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Cymus luridus.....		15♂				Montgomery, '01	Proc. Acad. Nat. Sci. Phila., 53, p. 261
Ichnodemus falicus.....	16 spg	9♂	8♂	8♂	XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Lygaeus bicrucis.....	14 spg 14 oog	8♂	7♂	7♂	XY to poles in 2nd	Wilson, '09 Wilson, '12	Jour. Exp. Zool., 6, p. 69 Jour. Exp. Zool., 13, p. 345
Lygaeus turcicus.....	14 spg 14 oog	8♂ (occasionally 9)	7♂	7♂	XY to poles in 2nd	Wilson, '05 Wilson, '06	Jour. Exp. Zool., 2, pp. 371 and 507 Jour. Exp. Zool., 3, p. 1

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Oedancala dorsalis.....	13 spg	7♂ (6 if small chroms. at poles)	7♂	6, 7♂	X to pole in 2nd	Montgomery, '01 Montgomery, '04 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Biol. Bull., 6, p. 137 Trans. Amer. Phil. Soc., 21, p. 97
Oncopeltus fasciatus.....	16 spg	9♂	8♂	8♂	XY to poles in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Oncopeltus fasciatus.....	16 spg 16 oog	9♂	8♂	8♂	XY to poles in 2nd (Sometimes X and Y equal in size)	Wilson, '09 Wilson, '12	Jour. Exp. Zool., 6, p. 69 Jour. Exp. Zool., 13, p. 345
Peliopelta abbreviata.....	14 spg	8♂ (9 if small chroms. side by side)	7♂		XY (equal) to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
8. Nabidae							
Coriscus ferus.....		10♂				Montgomery, '01	Trans. Amer. Phil. Soc., 20, p. 154
Nabis annulatus.....		10♂	8♂ (= 9, X and Y at poles in metaphase)	9♂	XY to poles in 2nd	Montgomery, '01 Montgomery, '06	Proc. Acad. Nat. Sci. Phila., 53, p. 261 Trans. Amer. Phil. Soc., 21, p. 97
9. Naucoridae							
Pelocoris femorata.....	20? spg					Montgomery, '01	Trans. Amer. Phil. Soc., 20, p. 154
10. Notonectidae							
Notonecta glauca.....		12–13♂	12♂ (figured)			Pantel and Sinéty '06	La Cellule, 23, p. 89
Notonecta insulata.....		14♂	12, 13♂ (2 chroms. may be fused or not)	12♂	XY to poles in 2nd	Browne, '10 Browne, '13	Biol. Bull., 20, p. 19 Jour. Exp. Zool., 14, p. 61

Notonecta irrorata	24 spg	13♂	12♂	12♂	XY to poles in 2nd	Browne, '10 Browne, '13	Biol. Bull., 20, p. 19 Jour. Exp. Zool., 14, p. 61
Notonecta undulata	26 spg	14♂	13♂	13♂	XY to poles in 2nd	Browne, '10 Browne, '13	Biol. Bull., 20, p. 19 Jour. Exp. Zool., 14, p. 61
11. Pentatomidae							
Banasa calva	26 spg 26 oog	14♂	13♂	13♂	XY to poles in 2nd	Wilson, '05	Jour. Exp. Zool., 2, p. 507
		15♂	13, 14♂	13, 14♂	XY to poles in 2nd. S to pole in 1st. From correction in '07	Wilson, '07	Biol. Bull., 12, p. 303
Banasa dimidiata	16 spg 16 oog	9♂	8♂	8♂	XY to poles in 2nd	Wilson, '07	Biol. Bull., 12, p. 303
Brochymena sp?	14 spg	8♂	7♂	7♂	XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Brochymena sp?	14 spg	8♂	7♂	7♂	XY to poles in 2nd	Wilson, '05	Jour. Exp. Zool., 2, p. 371
Coenus delius	14 spg	8♂	7♂	7♂	XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Coenus delius	14 spg 14 oog	8♂ (occasionally 9)	7♂	7♂	XY to poles in 2nd	Wilson, '05 Wilson, '06	Jour. Exp. Zool., 2, pp. 371 and 507 Jour. Exp. Zool., 3, p. 1
Cosmopepla carnifex	16 spg	9♂	8♂	8♂	XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Eurygaster alternatus		7♂	6♂	6♂	XY to poles in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Euschistus crassus	12 spg 12 oog	7♂	6♂	6♂	XY to poles in 2nd	Foot and Strobell, '12	Arch. Zellf., 9, p. 47

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Euschistus fissilis.....	14 spg 14 oog	8♂	7♂	7♂	XY to poles in 2nd	Wilson, '05 Wilson, '06	Jour. Exp. Zool., 2, pp. 371 and 507 Jour. Exp. Zool., 3, p. 1
Euschistus ictericus.....	14 spg 14 oog				XY in spg. XX in oog	Wilson, '06	Jour. Exp. Zool., 3, p. 1
Euschistus servus.....	14 spg 14 oog			7♂	XY to poles in 2nd	Wilson, '06	Jour. Exp. Zool., 3, p. 1
Euschistus servus.....	14 som	8♂	7♂	7♂	XY to poles in 2nd	Foot and Strobell, '14	Arch. Zellf., 12, p. 485
Euschistus tristigmus....	14 spg	8♂	7♂	7♂	XY to poles in 2nd	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Euschistus tristigmus.....	14 spg 14 oog				XY in spg. XX in oog	Wilson, '06	Jour. Exp. Zool., 3, p. 1
Euschistus variolarius? (= "Pentatoma").....	14 spg (13-15)	8♂ (8-11)	7♂ (6-9)	7♂	XY to poles in 2nd. From correction in '06. Prob. more than one species	Montgomery, '97 Montgomery, '98 Montgomery, '01 Montgomery, '06 Montgomery, '10 Montgomery, '11	Zool. Anz., 20, p. 457 Zool. Jahrb., 12, p. 1 Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97 Arch. Zellf., 5, p. 120 Jour. Morph., 22, p. 731
Euschistus variolarius....	14 spg 14 oog			7♂	XY to poles in 2nd	Wilson, '06	Jour. Exp. Zool., 3, p. 1
Euschistus variolarius....	14 som	8♂	7♂	7♂	XY to poles in 2nd	Foot and Strobell, '14	Arch. Zellf., 12, p. 485
Mineus bioculatus.....				7♂	XY to poles in 2nd. X and Y nearly equal	Wilson, '06	Jour. Exp. Zool., 3, p. 1
Mormidea lugens.....	14 spg	8♂	7♂		XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans Amer. Phil. Soc., 21, p. 97
Nezara hilaris.....	14 spg				From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer Phil. Soc., 20, p 154 Trans. Amer. Phil. Soc., 21, p. 97

Nezara hilaris.....	14 spg 14 oog	8♂	7♂	7♂	XY to poles in 2nd. X and Y nearly equal	Wilson, '05 Wilson, '06 Wilson, '11	Jour. Exp. Zool., 2, p. 371 Jour. Exp. Zool., 3, p. 1 Jour. Morph., 22, p. 71
Nezara viridula.....	14 spg 14 oog	8♂	7♂	7♂	XY to poles in 2nd	Wilson, '05 Wilson, '11	Jour. Exp. Zool., 2, p. 371 Jour. Morph., 22, p. 71
Oebalus pugnax.....	10 spg 10 oog				XY in spg. XX in oog	Wilson, '09	Jour. Exp. Zool., 6, p. 69
Pentatoma juniperina (= Chlorochroa).....	14 spg					Wilson, '13	Biol. Bull., 24, p. 392
Pentatoma senilis (= Rhytodolomia).....	6 spg	4♂	3♂	3♂	XY to poles in 2nd	Wilson, '13	Biol. Bull., 24, p. 392
Pentatoma see Euschistus variolarius							
Peribalus limbolaris.....	14 spg	8♂	7♂	7♂	XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Perillus confluens.....	14 spg	8♂	7♂	7♂	XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Podisus bracteatus..... Podisus crocatus.....	14 spg					Wilson, '09	Proc. 7th Intern. Zool. Cong., Boston, 1907, p. 1
Podisus modestus..... Podisus placidus.....	16 spg					Wilson, '09	Proc. 7th Inter. Zool. Cong., Boston, 1907, p. 1
Podisus spinosus (= maculiventris).....	16 spg	9♂	8♂	8♂	XY to poles in 2nd. From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
Podisus spinosus.....	16 spg 16 oog	9♂	8♂	8♂	XY to poles in 2nd	Wilson, '05 Wilson, '06	Jour. Exp. Zool., 2, p. 371 Jour. Exp. Zool., 3, p. 1
Stiretrus anchorago.....	14 spg 14 oog				XY in spg. XX in oog	Wilson, '09	Jour. Exp. Zool., 6, p. 69

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Thyanta calceata	27 spg 28 oog	15♂			XY to poles in 2nd X = 2 elements united linearly in 2nd	Wilson, '09 Wilson, '11	Proc. 7th Inter. Cong. Boston, 1907, p. 1 Jour. Morph., 22, p. 71
Thyanta custator	16 spg 16 oog				XY to poles in 2nd	Wilson, '11	Jour. Morph., 22, p. 71
Trichopepla semivittata	16 spg	8♂	7♂	7♂	XY to poles in 2nd Small chroms. of diploid usually lacking in haploid	Montgomery, '01 Montgomery, '04 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Biol. Bull., 6, p. 137 Trans. Amer. Phil. Soc., 21, p. 97
Trichopepla semivittata		8, 9♂	7♂		XY to poles in 2nd Small chrom. may be lacking in 1st (= 8). Uncertain case	Wilson, '05	Jour. Exp. Zool., 2, p. 371
12. Phymatidae							
Phymata wolffi?	29? spg	15♂			X? From correction in '06	Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97
13. Pyrrochoridae							
Largus cinctus	11 spg 12 oog				X in spg. XX in oog	Wilson, '07 Wilson, '09	Science, 25, no. 631, p. 191 Jour. Exp. Zool., 6, p. 69
Largus succintus	13 spg 14 oog				X in spg. XX in oog	Wilson, '07 Wilson, '09	Science, 25, no. 631, p. 191 Jour. Exp. Zool., 6, p. 69
Pyrrochoris apterus	24 spg 24 oog 24♀ som 24 cl	12♂ 12♀	12♂ 12♀	11, 12♂ 12♀	X to pole in 2nd♂ (= chromatin nucleolus)	Henking, '90 Henking, '91 Henking, '92	Intern. Monats. Anat. u. Phys., 7, p. 243 Zeits. wiss. Zool., 51, p. 685 Zeits. wiss. Zool., 54, p. 1

Pyrrochoris apterus.....	24 spg 24 oog 24 som	12♂	12♂	11, 12♂ (those with 11 degenerate)	X to pole in 2nd. X = 2 elements, separate in diploid, united in haploid	Gross, '06 Gross, '12	Zool. Jahrb., 23, p. 269 Zool. Jahrb., Abt. f. Zool., 32, p. 99
Pyrrochoris apterus.....	23 spg 24 oog	12♂	12♂	11, 12♂	X to pole in 2nd	Wilson, '09 Wilson, '09	Jour. Exp. Zool., 6, p. 69 Biol. Bull., 16, p. 199
			14. Reduviidae				
Acholla ampliata (= multispinosa).....	32 spg	16♂	16♂			Montgomery, '01 Montgomery, '06 Montgomery, '10	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97 Arch. Zellf., 5, p. 120 (note)
Acholla ampliata.....		16♂				Payne, '10	Biol. Bull., 18, p. 174
Acholla multispinosa (= Sinea diadema).....		16♂	16♂		3 chroms. associated in 1st	Montgomery, '01 Montgomery, '06 Montgomery, '10	Trans. Amer. Phil. Soc., 20, p. 154 Trans. Amer. Phil. Soc., 21, p. 97 Arch. Zellf., 5, p. 120 (note)
Acholla multispinosa.....	26 spg 30 oog	16♂	16♂	11, 15♂	XY to poles in 2nd X = 5 elements	Payne, '10	Biol. Bull., 18, p. 174
Apiomeris crassipes.....	24 spg	13♂	12♂	12♂	XY to poles in 2nd	Payne '12	Jour. Morph., 23, p. 331
Conorhinus sanguisugus..	23 spg	13♂	13♂	11, 12♂	XY to poles in 2nd X = 2 elements	Payne, '09 Payne, '12	Biol. Bull., 16, p. 119 Jour. Morph., 23, p. 331
Diplocodus exsanguis.....	26♂ som 26♀ som	14♂	13♂	13♂	XY to poles in 2nd	Payne, '09	Biol. Bull., 16, p. 119
Fitchia spinosula.....	27 spg 28 oog	15♂	15♂	13, 14♂	XY to poles in 2nd X = 2 elements	Payne, '09	Biol. Bull., 16, p. 119
Pnirontis modesta.....	25 spg	15♂	15♂	11, 14♂	XY to poles in 2nd X = 4 elements	Payne, '12	Jour. Morph., 23, p. 331

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Prionidus cristatus.....	26 spg					Montgomery, '01 Montgomery, '06	Trans. Amer. Phil. Soc., 20, p. 154 Trans Amer. Phil. Soc., 21, p. 97
Prionidus cristatus.....	26 spg 28 oog	15♂	15♂	12, 14♂	XY to poles in 2nd X = 3 elements	Payne, '09	Biol. Bull., 16, p. 119
Pselliodes cinctus.....	28 spg 30 oog	16♂	16♂	13, 15♂	XY to poles in 2nd X = 3 elements	Payne, '12	Jour. Morph., 23, p. 331
Reduvius personatus.....		12♂	11♂		XY to poles in 2nd	Payne, '12	Jour. Morph., 23, p. 331
Rocconata annulicornis...	27 spg	15♂	15♂	13, 14♂	XY to poles in 2nd X = 2 elements.	Payne, '09	Biol. Bull., 16, p. 119
Sinea complexa Sinea confusa Sinea diadema Sinea spinipes	28 spg 30 oog	16♂	16♂	13, 15♂	XY to poles in 2nd X = 3 elements	Payne, '09 Payne, '12	Biol. Bull., 16, p. 119 Jour. Morph., 23, p. 331
Sinea rileyi.....		18♂	18♂	13, 17♂	XY to poles in 2nd X = 5 elements	Payne, '12	Jour. Morph., 23, p. 331
15. Tingitidae							
Tingis clavata.....		7♂	7♂ (8 in one case, X and Y in same cell)	7♂	XY to poles in 1st	Montgomery, '01 Montgomery, '06	Proc. Acad. Nat. Sci. Phila., 53, p. 261 Trans. Amer. Phil. Soc., 21, p. 97
b. Homoptera							
1. Aphidae							
Aphid, bearberry = Phyllaphis coweni.....	5 spg 6 oog	3♂. One cyst had 6 (2X)	2, 3♂. Cells with 2 degenerate. One cyst had 4, 6 or 5♂	3♂	X to pole in 1st. One cyst had 2X, to pole in 1st or one X to each pole	Morgan, '15	Jour. Exp. Zool., 19, p. 285

Aphid, beech (wooly).....		8♂	7, 8♂		X to pole in 1st. From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, birch, paper.....		9♂				Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphid, clover.....		8♂				Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphid, goldenrod, beach..	12 pa cl	6♂	5, 6♂		X to pole in 1st. From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, goldenrod, tall = solidago altissima.....		6♂	5, 6♂		X to pole in 1st. From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, goumi.....	10 cl (winter egg)	5♀		5♂ pron 5♀ pron		Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphid, maple.....		16♂	15, 16♂		X to pole in 1st	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, milkweed (black).	8 spg 8 pa cl	4♂ 8 pa ♀	3, 4♂		X to pole in 1st. From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, milkweed (orange).....	8 pa cl	7, 8 pa ♀			May be ♂ and ♀ producing	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, milkweed (pale)..		7♂	7♂		One individual had 9 in 1st; probably different species	Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphid, nasturtium.....		4♂	3, 4♂		May be black milkweed	Stevens, '06 Stevens, '09	Carnegie Inst Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, oak, red I.....		7♂	7♂			Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphid, oak, red II.....		8♂				Stevens, '06	Carnegie Inst. Pub., 51, p. 1

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Aphid, oak (white).....		7♂				Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphid oenothera I = Aphis oenotherae.....	10 spg 10 pa cl 9♂ embryo	5♂ 5♀ 9♂ egg 10 pa ♀	4, 5♂	4, 5♂	X to pole in 1st. One chrom. goes to p.b., of ♂ egg. From correction in '09	Stevens, '05 Stevens, '05 Stevens, '06 Stevens, '09 Stevens, '10	Carnegie Inst. Pub., 36, p. 1 Jour. Exp. Zool., 2, p. 313 Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115 Biol. Bull. 18, p. 72
Aphid, oenothera II.....		4♂ 8 pa ♀	4♂	4♂		Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphid, pea.....	8 pa cl	8 pa ♀				Stevens, '06	Carnegie Inst. Pub., 51, p. 1
Aphis rosae.....	8 + 3 double pa cl	14♀			One polar body	Stschelkanovzew, '04	Biol. Centr., 24, p. 104
Aphis rosae.....		10♀	10♀		One p.b. in pa eggs. Chroms unreduced	Hewitt, '06	Mem. and Proc. Manchester Lit. and Phil. Soc., 50, no. 6, p. 1
Aphis rosae = (brown) rose.....	10 spg 10 pa cl	5♂ 5♀ 10 pa ♀	5♂ 5♀		2 p.b.s. in winter egg and reduction. 1 p.b. in pa egg and no reduction	Stevens, '05 Stevens, '06	Jour. Exp. Zool., 2, p. 313 Carnegie Inst. Pub., 51, p. 1
Aphis rosae.....	10 pa cl 10 pa som ♀	10♀				Von Baehr, '09	Arch. Zellf., 3, p. 269
Aphid, rose (green).....	14 pa cl	7♂ 14 pa ♀	6, 7♂		X to pole in 1st. From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool, 6, p, 115
Aphid, rose (migratory)..	18 cl (winter egg)	9♀				Stevens, '06	Carnegie Inst. Pub., 51, p. 1

Aphis saliceti.....	5 spg 5♂ som 6♀ som 6 pa ♀ cl	3♂ 6♀. One case, 5	2, 3♂. Those with 2 degenerate	3♂	X to pole in 1st	Von Baehr, '08 Von Baehr, '09 Von Baehr, '12	Zool. Anz., 33, p. 507 Arch. Zellf., 3, p. 269 La Cellule, 17, p. 383
Aphis salicola.....	5 spg	3♂	2, 3♂. Those with 2 degenerate	3♂	X to pole in 1st	Morgan, '09	Jour. Exp. Zool., 7, p. 239
Aphis salicola (= Harpswell willow).....	5 spg 6 pa cl	3♂ 6 pa♀	2, 3♂		X to pole in 1st. From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, star cucumber....		5♂	4, 5♂		X to pole in 1st From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Aphid, willow, Harpswell, see Aphis salicola							
Aphid, willow, Saranac...		5♂	4, 5♂		X to pole in 1st. From correction in '09	Stevens, '06 Stevens, '09	Carnegie Inst. Pub., 51, p. 1 Jour. Exp. Zool., 6, p. 115
Chaitophorus viminalis...		10♂				Morgan, '09	Jour. Exp. Zool., 7, p. 239
Lachnus dentatus.....		4♂	3, 4♂. Those with 3 degenerate		X to pole in 1st	Morgan, '09	Jour. Exp. Zool., 7, p. 239
Melanoxanthus salicicola Melanoxanthus salicis	6 spg 6 oog 6 pa ♀ cl	3♂ 3♀ 6 pa♀	3♂ 3♀	3♂ pron 3♀ pron	One p.b. in pa	Tannreuter, '07	Zool. Jahrb., 24, p. 609
Pemphigus pyriformis Pemphigus spirotheca	20 pa ♀ som	20♀				Von Baehr, '08 Von Baehr, '09	Zool. Anz., 33, p. 507 Arch. Zellf., 3, p. 269
Phyllaphis coweni, see Aphid, bearberry							
Phylloxera caryaecaulis...	5(= 6) spg 6(= 8) oog	3(= 4)♂ 3(= 4)♀ 6(= 8)♀ pa	3(= 4), 2♂ 3(= 4)♀ Spc with 2 degenerate	3(= 4)♂ 3(= 4)♀ 5♂ pa egg 6♀ pa egg	Double X to pole in 1st. Double X to p.b. in pa ♂ producers. One p.b. in pa line.	Morgan, '08 Morgan, '09 Morgan, '09 Morgan, '12 Morgan, '15	Proc. Soc. Exp. Biol. and Med., 5, p. 56 Science, 29, p. 234 Jour. Exp. Zool., 7, p. 239 Jour. Exp. Zool., 12, p. 479 Jour. Exp. Zool., 19, p. 285

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTN	-TID	REMARKS	OBSERVER	REFERENCE
Phylloxera caryaefoliae...	8 egg of migrant					Morgan, '09	Jour. Exp. Zool., 7, p. 239
Phylloxera caryaeglobuli.	22♂ eggs 22♀ eggs					Morgan, '06 Morgan, '09	Biol. Bull., 10, p. 201 Jour. Exp. Zool., 7, p. 239
Phylloxera depressa.....	6 egg of stem mother					Morgan, '09	Jour. Exp. Zool., 7, p. 239
Phylloxera fallax.....	10 spg 10 oog 10♀ som	6♂ 6♀ 12 pa♀	4, 6♂ 6♀ Spc with 4 degenerate	6♂ 6♀ 10♂ pa egg 12♀ pa egg	2X to pole in 1st; may be united. 2X to p.b. in pa ♂ producers. One p.b. in pa line	Morgan, '06 Morgan, '09 Morgan, '09 Morgan, '12 Morgan, '15	Biol. Bull., 10, p. 201 Science, 29, p. 234 Jour. Exp. Zool., 7, p. 239 Jour. Exp. Zool., 12, p. 479 Jour. Exp. Zool., 19, p. 285
Phylloxera globosum.....	6 egg of stem mother 6♂ eegs 6♀ eggs					Morgan, '06 Morgan, '09	Biol. Bull., 10, p. 201 Jour. Exp. Zool.. 7, p. 239
Phylloxera subelliptica...	6 egg of migrant					Morgan, '09	Jour. Exp. Zool., 7, p. 239
Schizoneura lanigera } .... Schizoneura ulmi }	12 pa♀ som	12♀ (11 in 2 cases)				Von Baehr, '08 Von Baehr, '09	Zool. Anz., 33, p. 507 Arch. Zellf., 3, p. 269
2. Cercopidae							
Aphrophora parallela.....		15♂	14, 15♂		X to pole in 1st	Boring and Fogler, '15	Biol. Bull., 29, p. 312
Aphrophora quadrangularis (= Lepronia quad).....	21 spg	11♂ 12♂	10, 11♂ 11, 12♂	10, 11♂	X to pole in 1st. Probably 2 species	Boring, '07 Boring, '13	Jour. Exp. Zool., 4, p. 469 Biol. Bull., 24, p. 133
Aphrophora quadrangularis (Harpswell).....	23 spg 24 oog 23♂ som	12♂	11, 12♂	11, 12♂	X to pole in 1st	Stevens, '06	Carnegie Inst. Pub. no. 36, II, p. 33

Aphrophora quadrinotata		14♂	13, 14♂	13, 14♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Aphrophora spumaria....		6–12♂				Carnoy, '85	La Cellule, 1, p. 189
Aphrophora spumaria....		12♂			X to pole in 1st	Boring, '13	Biol. Bull., 24, p. 133
Clastoptera obtusa.....	15 spg	8♂	7, 8♂	7, 8♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Clastoptera proteus.....		7♂			X to pole in 1st	Boring and Fogler, '15	Biol. Bull., 29, p. 312
Lepronia quadrangularis, see Aphrophora quadrangularis							
Philaenus lineatus.....	29 spg	15♂	14, 15♂		X to pole in 1st	Boring and Fogler, '15	Biol. Bull., 29, p. 312
Philaenus spumarius.....	23 spg 24 oog 23♂ som 24♀ som	12♂	11, 12♂		X to pole in 1st	Boring, '13	Biol. Bull., 24, p. 133
3. Cicadidae							
Cicada tibicen.....	12 spg	6♂ (= 24 el)				Wilcox, '95	Bull. Mus. Comp. Zool. Harvard, 27, p. 3
4. Coccidae							
Icerya purchasi.....	4 spg 4 oog 4 som	2♂ 2♀	2♂ 2♀			Pierantoni, '12 Pierantoni, '14	Archivio Zoologico, 5, p. 321 Archivio Zoologico, 7, p. 27
5. Fulgoridae							
Amphiscepa bivittata....	25 spg	13♂	12, 13♂	12, 13♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Poeciloptera bivittata....		13♂	12, 13♂	12, 13♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Poeciloptera pruinosa Poeciloptera septentrionalis	27 spg 28♀ som	14♂	13, 14♂	13, 14♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469

II. ARTHROPODA—Continued

6. Jassidae

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Agallia sanguinolenta.....		11♂	10, 11♂	10, 11♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Chlorotettix unicolor... } Chlorotettix vividus.... }	21 spg	11♂ 9♂	10, 11♂ 8, 9♂	10, 11♂ 8, 9♂	X to pole in 1st. Two species confused	Boring, '07	Jour. Exp. Zool., 4, p. 469
Diedrocephala coccinea. } Diedrocephala mollipes. }	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Phlepsius irroratus.....	15 spg	8♂	7, 8♂	7, 8♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469

7. Membracidae

Atymna castanea.....		11♂	10, 11♂	10, 11♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Campylenchia curvata...	19 spg	10♂	9, 10♂	9, 10♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Ceresa bubalus } Ceresa diceros } ..... Ceresa taurina }		11♂	10, 11♂	10, 11♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
Enchenopa binottata.....	19 spg (20 in 2 cases)	10♂	10♂	9, 10♂	X to pole in 2nd	Boring, '07	Jour. Exp. Zool., 4, p. 469
Enchenopa binottata.....	20 spg 20 oog	10♂	10♂	10♂	XY to poles in 1st	Kornhauser, '14	Arch. Zellf., 12, p. 241 or Bull. Mus. Comp. Zool., Harvard, 244, p. 241
Enchenopa curvata (= Campylenchia curvata)	19 spg 20 oog	10♂	9, 10♂ (occasionally 19, no cell division)	9, 10♂	X to pole in 1st. Occasionally X divides	Kornhauser, '14	Arch. Zellf., 12, p. 241 or Bull. Mus. Comp. Zool. Harvard, 244, p. 241
Entilia sinuata.....	21 spg	11♂	10, 11♂	10, 11♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469

Thelia bimaculata.....	21 spg 22 oog	11♂			X to pole in 1st	Kornhauser, '14	Arch. Zellf., 12, p. 241 or Bull. Mus. Comp. Zool. Harvard, 244, p. 241
Vanduzea arcuata.....	17 spg	9♂	8, 9♂	8, 9♂	X to pole in 1st	Boring, '07	Jour. Exp. Zool., 4, p. 469
			5. Hymenoptera a. Apidae				
Apis mellifica (= "Biene").....	16 pa cl	16♀	8♀	8♀	Drone egg pa, with 2 p.b.s. Ootid chroms probably split in cl	Petrunkewitsch., '01 Petrunkewitsch., '03	Zool. Jahrb., 14, p. 573 Zool. Jahrb., 17, p. 481
Apis mellifica.....	16 spg	16♂	16♂	16♂	Half 1st spc rudimentary with no chroms. Half 2nd spc rudimentary with chroms	Meves, '03 Meves, '07	Anat. Anz., 24, p. 29 Arch. mikr. Anat., 70, p. 414
Apis mellifica (= "Honey-bee").....		16♂	16♂		As above	Mark and Copeland, '06	Proc. Amer. Acad. Arts and Sci., 42, p. 101
Apis mellifica.....	16 oog	8♂ (double)	16♂	16♂	As above	Doncaster, '06 Doncaster, '07	Anat. Anz., 29, p. 490 Anat. Anz., 31, p. 168
Apis mellifica.....	16 spg (single) 16 oog (double) 16 pa cl 32 fert. cl	16♂ (dyads) 8♀ (tetrads)	16♂ (dydas) 8♀ (dyads)	16♂ (8 double) 8♀ (bivalent) 16♀ pron	As above	Nachtsheim, '12 Nachtsheim, '13	Sitz. Gesel. Morph. u. Physiol. München, '12, p. 1 Arch. Zellf., 11, p. 169
Osmia cornuta.....	16 spg 32 or 64 som	16♂		8♂	Chroms pair at 1st anaphase. 1 mat. div. and half 1st spc rudimentary with chroms	Armbruster, '13 Armbruster, '13	Ber. Naturf. Ges. Freiburg, 20, p. 4 Arch. Zellf., 11, p. 242
Xylocopa violacea.....	16 spg Numerous in follicle cells	16♂	16♂	16♂	As above in Apis	Granata, '09 Granata, '13	Biologica 2, no. 15, p. 1 Mon. Zool. Ital., 24, p. 31
			b. Chalcididae				
Ageniaspis fuscicollis (= Encyrtus).....		ca 10♀			2 p.b.s in pa. Chroms fuse later	Silvestri, '08	Bol. R, Scuola Sup. Portici, 3, p. 29

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Ageniaspis fuscicollis.....		4♀	4♀	4♀		Martin, '14	Zeit. wiss. Zool., 110, p. 419
Copidosoma buyssoni....		12♀	10–12♀			Silvestri, '14	Anat. Anz., 47, p. 45
Copidosoma gelechiae....		12♀ Sometimes 11			May not be mat. spindle	Hegner, '14 Hegner, '15	Anat. Anz., 46, p. 51 Jour. Morph., 26, p. 495
Prospalta berlesei (= Prospaltella).....		ca 10–12♀			1 p.b.	Silvestri, '08 Silvestri, '15	Boll. Lab. Zool. R, Sc., Agr. Portici, 3, p. 22 Boll. Lab. Zool. R, Sc., Agr. Portici, 10, p. 64
c. Cynipidae							
Dryophanta erinacei.....	12 som♂ 13–14 som♀		12♂		1st spc div. = cytop. only	Wieman, '15	Biol. Bull., 28, p. 34
Neuoterus lenticularis (= Spathegaster baccarum).....	10 pa cl 10 som♂ 20 pa cl 20 som♀	10♀	10♀	10♀	Parthenogenetic. 2 types of eggs, one with p.b.s. may be ♀s; other lacking p.b.s. ♂s	Doncaster, '09 Doncaster, '11	Proc. Roy. Soc., 82B, p. 88 Proc. Roy. Soc. 83B, p. 476
	10 spg 20 oog 18–20 cl 18–20 som	10♀	10♂	10♂ 10?♀	Sexual. Half 1st spc rudimentary with no chroms		
Rhodites rosae.....	18 pa cl (= 18–20)	9♀	9♀			Henking, '02	Zeit. wiss. Zool., 54, p. 1
Rhodites rosae.....	12 oog 12 pa cl, later = 6 double	10–12♀ (prob. 12)	10–12♀	10–12♀		Schleip, '09	Zool. Anz., 35, p. 203
d. Formicidae							
Formica sanguinea.....	ca 24 pa cl ca 48 fert. cl	24♀	24♀	24♀	Pa and fert.	Schleip, '08	Zool. Jahrb., 26, p. 651
Lasius niger.....	16–17 pa cl 20 fert. cl	10♀	10♀			Henking, '92	Zeit. wiss. Zool., 54, p 1

e. Tenthredinidae

Croesus varus			7–8 ♀, split later into 14–16		Parthenogenetic	Doncaster, '06	Q. J. M. S., 49, p. 561
Nematus lacteus			ca 8 ♀		Parthenogenetic	Doncaster, '06	Q. J. M. S., 49, p. 561
Nematus ribesii	ca 16 spg	ca 8 ♂ ca 8 ♀			1st spc div. abortive. Eggs parthenogenetic. From correction in '09	Doncaster, '04 Doncaster, '06 Doncaster, '07 Doncaster, '08 Doncaster, '09 Doncaster, '10	Proc. Camb. Phil. Soc., 12, p. 474 Q. J. M. S., 49, p. 561 Q. J. M. S., 51, p. 101 Proc. Camb. Phil. Soc., 14, p. 22 Nature 82, p. 127 Science, 31, p. 192
Poecilosoma luteolum	8 pa cl	8 ♀ (possibly 7)			Parthenogenetic	Doncaster, '06 Doncaster, '06	Proc. Camb. Phil. Soc., 13, p. 103 Q. J. M. S., 49, p. 561

f. Vespidae

Vespa crabro		16+ ♀			1st spc rudimentary with no chroms	Meves and Duesberg, '08	Arch. mikr. Anat., 71, p. 571
Vespa maculata		16? ♂				Mark and Copeland, '07	Proc. Amer. Acad. Arts and Sci., 43, p. 69

C. Lepidoptera

a. Heterocera

1. Arctiidae

Arctia caja		31 ♂	31 ♂			Kernewitz, '14 Kernewitz, '15	Zool.. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Arctia hebe		30–33 ♂				Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Chelonia caja		24-28 ♂				Carnoy, '85	La Cellule, 1, p. 189
Hipocrita jacobaea		31 ♂				Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Phragmatobia fulginosa..	prob. 56 spg 56♂ cl 58♀ cl Few 61, 62 cl	28♂ 28♀	28♂ 28, 29♀	28♂ 28, 29♀	XX in ♂ diploid. X + 3Y in ♀ diploid. XY in ♀ to poles in 1st. Y splits in two in 1st anaphase = 29	Seiler, '13 Seiler, '14	Zool. Anz., 41, p. 246 Arch. Zellf., 13, p. 159
Spilosoma mendicum.....		31♂	31♂			Kernewitz, '14 Kernewitz., '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
2. Bombycidae							
Bombyx mori.....		12♀ at least				Henking, '92	Zeit. wiss. Zool., 54, p. 1
Bombyx mori.....	26–28 spg	28♂ (26–28)	28♂	14♂	Half chroms. to each pole in 2nd	Toyama, '94 Toyama, '94	Zool. Anz., 17, p. 20 Imp. Univ. Tokyo Coll. Agr. Bull., vol. II, no. 3, p. 125
Bombyx mori (17 varieties).....	50–60 spg 50–60 oog	28♂	28♂	28♂		Yatsu, '13	Annot. Zool. Japonenses, 8, pt. 2, p. 215
Theophila mandriana (= Bombyx).....		27♂	27♂			Yatsu, '13	Annot. Zool., Japonenses, 8, pt. 2, p. 215
3. Geometridae							
Abraxas grossulariata	56 spg (50–56) 56 oog	28♂ (1 case 27) 28♀	28♂ or 26 + 1 pair in contact	28♂	XX in ♂ diploid. X in ♀ diploid. X to pole in 2nd ♀	Doncaster, '10	Proc. Camb. Phil. Soc. 16, p. 44
Abraxas lacticolor and cross	55 oog in some strains		28♀ in 56 strains 27, 28♀ in 55 strains	28♀ 27, 28♀		Doncaster, '11 Doncaster, '12 Doncaster, '13 Doncaster, '14	Jour. Genetics 1, p. 179 Jour. Genetics, 2, p. 189 Jour. Genetics, 3, pp. 1 and 229 Jour. Genetics, 4, p. 1
Nyssia zonaria (= Ithysia).....	ca 112 spg (100+)	56♂ 50–60♀	56♂			Doncaster, '14	Jour. Genetics, 4, p. 1
Ourapteryx sambucaria...		31♂				Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1

4. Lasiocampidae							
Cosmotriche potatoria....		31♂				Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Dendrolimus pini.....		30♂	30♂			Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Malacosoma castrense.....		31♂				Kernewitz, '15	Arch. Naturges., 81, p. 1
5. Lymantriidae							
Leucoma salicis.....		12+♀				Henking, '92	Zeit. wiss. Zool., 54, p. 1
Lymantria dispar Lymantria japonica	62 cl	31♂ 31♀	31♂	31♂	One embryo with over 100	Seiler, '14	Arch. Zellf., 13, p. 159
Orgyia antiqua.....		14♀				Seiler, '14	Arch. Zellf., 13, p. 159
Orgyia gonostigma.....		30♀				Seiler, '14	Arch. Zellf., 13, p. 159
6. Monocteniidae							
Lycia hirtaria (= Biston)	28 spg 28 oog	13♂ (1 double) 13 + chrom. nucleolus ♀	13 (1 double), 14♂		Possibly X to pole in 1st	Doncaster, '14	Jour. Genetics, 3, p. 229
7. Noctuidae							
Acronycta sp?.....		29♂				Cook, '10	Proc. Acad. Nat. Sci. Phila., 62, p. 294
Agrostis triangulum.....		29♂	29♂			Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Leucania impura.....		31♂	31♂			Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
8. Notodontidae							
Dicranura vinula.....		21♂				Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Phalera bucephala.....	ca 60 spg					Kernewitz, '15	Arch. Naturges., 81, p. 1
Pygaera anchoreta.....		30♂ (sometimes 31)	30♂		Different in apyrene	Federley, '13	Zeit. ind. Abs. u. Vererb., 9, p. 1
Pygaera bucephala.....		30♂	12–14♂			Platner, '86	Intern. Monats. Anat. u. Physiol., 3, p. 341
Pygaera curtula.....		29♂	29♂			Federley, '13	Zeit. ind. Abs. u. Vererb., 9, p. 1
Pygaera pigra.....	40+ spg	23♂	23♂		Different in apyrene	Federley, '13	Zeit. Ind. Abs. u. Vererb., 9, p. 1
9. Pyralidae							
Ephestia kuehniella.....		29♂	29♂			Kernewitz, '15	Arch. Naturges., 81, p. 1
Galleria melonella.....	ca 60 spg	30♂			Different in apyrene	Von Kemnitz, '14	Arch. Zellf., 12, p. 567
10. Saturnidae							
Antherea pernyi.....			33♂ (sometimes 34)			Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Automeris io.....		31♂	31♂		Equal XY	Cook, '10	Proc. Acad. Nat. Sci., Phila., 64, p. 294
Callosamia promethea....	38 spg	19♂	19♂	19♂	Equal XY	Cook, '10	Proc. Acad. Nat. Sci., Phila., 64, p. 294
Philosamia cynthia.....	26 spg 26 oog 26 som	13♂ 13♀	13♂ 13♀	13♂ 13♀		Dederer, '07 Dederer, '15	Biol. Bull., 13, p. 94 Jour. Morph., 26, p. 1
Philosamia cynthia.....	26 spg	13♂				Cook, '10	Proc. Acad. Nat. Sci., Phila., 64, p. 294
Samia cecropia.....		30♂	30♂		Equal XY	Cook, '10	Proc. Acad. Nat. Sci., Phila., 64, p. 294

Saturnia pavonia.....		29♂	29♂			Kernewitz, '15	Arch. Naturges., 81, p. 1
Telea polyphemus.....		30♂	30♂			Cook, '10	Proc. Acad. Nat. Sci. Phila., 64, p. 294
11. Sphingidae							
Cherocampa elpenor.....		29♂	29♂			Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Deilephila euphorbiae....		28–29♂				Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Deilephila euphorbiae....	28 spg	28♂ (sometimes 29)	28♂	14♂	Reduction in 2nd	Buder, '15	Arch. Zellf., 14, p. 26
Dilina tiliae.....		29♂				Federley, '14	Ofver. Finsk. Vetensk. Soc. Förhand., 56, p. 1
Dilina tiliae.....		29♂				Kernewitz '15	Arch. Naturges, 81, p. 1
Smerinthus ocellatus.....		27♂	27♂			Federley, '14	Ofver. Finsk. Vetensk. Soc. Förhand., 56, p. 1
Smerinthus ocellatus.....		28♂	28♂			Kernewitz, '15	Arch. Naturges., 81, p. 1
Smerinthus populi.....		28♂	28♂			Federley, '14	Ofver. Finsk. Vetensk. Soc. Förhand., 56, p. 1
Sphinx ligustri.....		27–29♂				Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
12. Tortricidae							
Cacaecia cerasivorana.....		30♂	30♂		Equal XY	Stevens, '06	Carnegie Inst. Pub., 36, 11, p. 33

II. ARTHROPODA—Continued

b. Rhopalocera

1. Nymphalidae

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Euvanessa antiope		30♂			Equal XY	Stevens, '06	Carnegie Inst. Pub., 36, II, p. 33
Polygonia-c-album			31♂			Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
2. Papilionidae							
Papilio podalirius	54–58 spg					Kernewitz, '15	Arch. Naturges., 81, p. 1
Papilio rutulus	28 spg	28♂	28♂	14♂		Munson, '06	Proc. Boston Soc. Nat. Hist., 33, p. 43
3. Pieridae							
Aporia crataegi			25♂			Kernewitz, '14 Kernewitz, '15	Zool. Anz., 45, p. 137 Arch. Naturges., 81, p. 1
Colias myrmidone			30-31♂			Kernewitz, '15	Arch. Naturges., 81, p. 1
Pieris brassicae	ca 30 spg ca 28 oog ca 28 cl	14 or 15♂ 14♀	14♀	14♀		Henking, '90 Henking, '90 Henking, '91 Henking, '92	Intern. Monats. Anat. u. Physiol., 7, p. 243 Zeits. wiss. Zool., 49, p. 503 Zeits. wiss. Zool., 51, p. 685 Zeits. wiss. Zool., 54, p. 1
Pieris brassicae	ca 30 spg 30 oog	15♂ 15♀ (= 14 + chromatin nucleolus) One cell 25	15♂		Possibly XY in ♂ No XY in ♀	Doncaster, '12 Doncaster, '12	Proc. Camb. Phil. Soc., 16, p. 491 Jour. Genetics, 2, p. 189
Pieris napi	50? spg	25♂				Henking, '90	Intern. Monats. Anat. u. Physiol., 7, p. 243

			7. Neuroptera				
			a. Corrodentia				
Cerastipsocus venosus....	17 spg	9♂	8, 9♂	8, 9♂	X to pole in 1st	Boring, '13	Biol. Bull., 24, p. 125
			b. Isoptera				
Termopsis angusticollis...	52 spg	26♂	26♂		No X	Stevens, '05	Carnegie Inst. Pub., 36, p. 1
			c. Odontata				
Anax junius.....	27 spg 28 follicle cells	14♂	14♂	13, 14♂	X to pole in 2nd. From correction in '08	McGill, '04 Lefevre and McGill, '08	Univ. Missouri Studies, 2, no. 5, p. 1 Amer. Jour. Anat., 7, p. 469
Calopteryx virgo.....		8–14♂	5–7♂			Carnoy, '85	La Cellule, 1, p. 189
			d. Trichoptera				
Panorpa communis.....		14–18♂				Carnoy, '85	La Cellule, 1, p. 189
Platyphlax designatus....	55–60 oog	30♂	30♂		Chromatin nucleolus divides in both divisions	Lutman, '10	Biol. Bull., 19, p. 55
			8. Orthoptera				
			a. Acrididae				
Acridium granulatus see under Tettigidae							
Acridium linolea.....		10–16♂				Carnoy, '85	La Cellule, 1, p. 189
Acrolophitus.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Aeoloplus	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Amphitornus.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Arphia.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Arphia pseudonietana....	23 spg					Meek, '13	Phil. Trans. Roy. Soc., London. 203B, p. 1.

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARLS	OBSERVER	REFERENCE
Arphia simplex.....	23 spg	12♂			X to pole in 1st	Carothers, '13	Jour. Morph., 24, p. 487
Arphia tenebrosa.....	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st. One animal had 2 X, to same or opposite poles in 1st; = 24 spg, 13 1st, 11, 12, 13 2nd	Davis, '08	Bull. Mus. Comp. Zool. Harvard, 53, p. 57
Aulocara.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Boopedon.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Brachystola.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Brachystola magna.....	23 spg 22 oog	12♂	11, 12♂	11, 12♂	X to pole in 1st	Sutton, '02	Biol. Bull., 4, p. 24
Brachystola magna.....	23 spg	12♂		11, 12♂	X to pole in 1st	Carothers, '13	Jour. Morph., 24, p. 487
Caloptenus femur-rubrum, see Melanoplus Camnula.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Chortophaga viridifasciata.....	19 spg (= 23) or 23 spg	12♂	11, 12♂		X to pole in 1st. Union of chroms. in spg to form tetrads	McClung, '05 McClung, '14	Biol. Bull., 9, p. 304 Jour. Morph., 25, p. 651
Chortophaga viridifasciata.....	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Davis, '08	Bull. Mus. Comp. Zool. Harvard, 53, p. 57
Clinocephalus.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Dactylotum.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651

Dissosteira	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Dissosteira carolina	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Davis, '08	Bull. Mus. Comp. Zool. Harvard, 53, p. 57
Encoptolophus	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Eremnus	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Hadrotettix	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Hesperotettix pratensis Hesperotettix speciosus Hesperotettix viridis	22 spg (= 23)	11♂ (= 12)			X attached to another chromosome in spg and 1st. To pole in 1st	McClung, '05 McClung, '14	Biol. Bull., 9, p. 304 Jour. Morph., 25, p. 651
Hippiscus phoenicopterus	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Hippiscus tuberculatus	23 spg 24 oog	12♂	11, 12♂	11, 12♂	X to pole in 1st	Davis, '08	Bull. Mus. Comp. Zool. Harvard, 53, p. 57
Mecostethus	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Melanoplus	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Melanoplus angustipennis	23 spg		11, 12♂		X	Meek, '13	Phil. Trans Roy. Soc., London, 203B, p. 1
Melanoplus atlanis	23 spg	12♂	11, 12♂		X to pole in 1st	Nowlin, '12	Kansas Univ. Sci. Bull., 6, p. 399
Melanoplus atlanis	23 spg		11, 12♂		X	Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
Melanoplus bivittatus	23 spg	12♂	11, 12♂		X to pole in 1st	Nowlin, '08	Kansas Univ. Sci. Bull., 4, p. 265
Melanoplus bivittatus	23 spg					Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
Melanoplus dawsonii	23 spg					Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Melanoplus differentialis..	23 spg	12♂	11, 12♂		X to pole in 1st	Nowlin, '12	Kansas Univ. Sci. Bull., 6, p. 399
Melanoplus femoratus....	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Davis, '08	Bull. Mus. Comp. Zool. Harvard, 53, p. 57
Melanoplus femur-rubrum (= Caloptenus)....	12 spg 12 som	6♂ (= 24 el)	6♂ (= 12 el)	6♂	Tetrads and dyads = separate elements	Wilcox, '94 Wilcox, '95 Wilcox, '98	Anat. Anz., 10, p. 303. Bull. Mus. Comp. Zool., Harvard, 27, p. 3 Anat. Anz., 14, p. 194
Melanoplus femur-rubrum.....	23 spg 22? oog	12♂	11, 12♂	11, 12♂	X to pole in 1st	Nowlin, '12	Kansas Univ. Sci. Bull., 6, p. 399
Melanoplus packardii....	23 spg	12♂	11, 12♂		X to pole in 1st	Nowlin, '12	Kansas Univ. Sci. Bull., 6, p. 399
Melanoplus packardii.....	23 spg		11, 12♂		X	Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
Mermiria bivittata.....	21 spg (= 23)	10♂ (= 12)			X attached to two other chroms., one of which passes to each pole in 1st, X going to pole with one of them	McClung, '05 McClung, '14	Biol. Bull., 9. p. 304 Jour. Morph., 25, p. 651
Mestobregma.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Oedipoda.....	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Buchner, '09	Arch. Zellf., 3, p. 335
Orphulella.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Pamphagus marmoratus..	19 spg 20♀ som	10♂			X to pole in 1st	Granata, '10	Arch. Zellf., 5, p. 182
Paratettix, see under Tettigidae							
Paroxya.....	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651

Philbostroma	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Phoetaliotes	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Phrynotettix	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Phrynotettix magnus	23 spg	12♂	11, 12♂		X to pole in 1st	Pinney, '08	Kansas Univ. Sci. Bull., 4, p. 309
Proracorypha	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Pseudopomala	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Psinidia	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Rhomaleum	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Schistocerca	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Schistocerca alutacea Schistocerca americana	23 spg	12♂				Hartmann, '13	Biol. Bull., 24, pp. 226 and 239
Scirtettica	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Spharagemon	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph , 25, p. 651
Stauronotus maroccanus	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Artom, '09	Biologica, 2, no. 16, p. 1
Stenobothrus (prob. = Chorthippus)	21 spg	11♂	10, 11♂		X to pole in 1st	McClung,' 14	Jour. Morph., 25, p. 651
Stenobothrus bicolor	17 spg	9♂	8, 9♂		X to pole in 1st	Meek, '13	Phil. Trans. Roy. Soc., London, 203B, p. 1
Stenobothrus biguttulus	16–17 spg (prob. 17)	9♂	8, 9♂	8, 9♂	X to pole in 1st	Gérard, '09 Gérard, '09	Bull. Soc. Roy. Sci. med. et nat. Bruxelles, 67, p. 25 Arch. Biol., 24, p. 543
Stenobothrus curtipennis	17 spg	9♂	8, 9♂	8, 9♂	X to pole in 1st	Davis, '08	Bull. Mus. Comp. Zool. Harvard, 53, p. 57

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Stenobothrus curtipennis	17 spg	9♂	8, 9♂			Meek, '12	Jour. Linnean Soc., 32, p. 107
Stenobothrus parallelus	17 spg		8, 9♂		X to pole in 1st	Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
Stenobothrus viridulus (or bicolor)		12–18♂	6–8♂			Carnoy, '85	La Cellule, 1, p. 189
Stenobothrus viridulus	17 spg	9♂	8, 9♂		X to pole in 1st	Meek, '11 Meek, '13	Jour. Linnean Soc., 32, p. 1 Phil. Trans. Roy. Soc. London, 203B, p. 1
Syrbula	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Syrbula acuticornis	20 spg	10♂	10♂	10♂	Bivalent heterochrom, divides in both divisions	Montgomery, '05	Proc. Acad. Nat. Sci. Phila., 57, p. 162
Syrbula admirabilis	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Robertson, '08	Kansas Univ. Sci. Bull., 4, p. 275
Tettigidae (subfamily of Acrididae) Acridium granulatus Paratettix Tettigidea parvipennis	13 spg 14 oog	7♂			X to pole in 1st	Robertson, '08 Robertson, '15	Kansas Univ. Sci. Bull., 4, p. 275 Jour. Morph., 26, p. 109
Paratettix leuconotus-leucothorax	13 spg	7♂	6, 7♂		X to pole in 1st	Harman, '15	Biol. Bull., 24, p. 262
Trimerotropis	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Tropidolophus	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651
Tryxalis	23 spg	12♂	11, 12♂		X to pole in 1st	McClung, '14	Jour. Morph., 25, p. 651

Tryxalis nasuta.....	21 spg	11♂			X to pole in 1st	Brunelli, '10 Brunelli, '11	Mem. Soc. ital. Sci., ser. 3a, vol. 16, p. 221 Mem. R. Acad. Lincei, ser. Va, vol. 8, p. 633
b. Blattidae							
Blatta germanica.....		12♂				Erlanger, '96 Erlanger, '97	Zool. Anz., 19, p. 65 Zool. Centralb., 4, p. 1
Blatta germanica.....	23 spg 24 oog	12♂	11, 12♂	11, 12♂	X to pole in 1st	Wassilieff, '07	Arch. mikr. Anat., 70, p. 1
Blatella germanica (= Blatta).....	23 spg 23? ♀ som	12♂	11, 12♂		X to pole in 1st	Stevens, '05	Carnegie Inst. Pub. no. 36, p. 1
Leucophaea maderiae.....	23 spg 24 oog		11, 12♂		X to pole in 1st	Morse, '09	Arch. Zellf., 3, p. 483
Periplaneta americana....	32 spg	16♂ (gemini)	16♂			Farmer and Moore, '04 Moore and Robinson, '04 Moore and Arnold, '05	Q. J. M. S., 48, p. 489 Q. J. M. S., 48, p. 571 Proc. Roy. Soc., 77, p. 563
Periplaneta americana....	33 spg 34 oog	17♂	16, 17♂	16, 17♂	X to pole in 1st	Morse, '09	Arch. Zellf., 3, p. 483
c. Forficulidae							
Anisolabis maritima.....	24 spg 24 oog 24 som	12♂	12♂	12♂	Equal pair heterochromosomes	Randolf, '08	Biol. Bull., 15, p. 111
Forficula auricularia.....		10–14♂				Carnoy, '85	La Cellule, 1, p. 189
Forficula auricularia.....		12♂	12–14♂			St. George, '87	Festschrift. f. Kölliker, p. 51
Forficula auricularia.....	24 spg	12♂	12♂			Sinéty, '01	La Cellule, 19, p. 117
Forficula auricularia.....	24 or 26 spg	12–14♂	12–14♂	12–14♂	One accessory chrom. (13) or two (14) or none (12)	Zweiger, '06 Zweiger, '06	Zool. Anz., 30, p. 220 Jen. Zeits., 35, p. 143
Forficula auricularia.....	24 spg	12♂	12♂ (occasionally 11 and 13)	12♂	XY to poles in 1st	Stevens, '10	Jour. Exp. Zool., 8, p. 227

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENOGENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Forficula auricularia.....	24 spg	12♂	12♂		Pair heterochromosomes in 2nd	Meek, '13 Meek, '13 Meek, '15	Phil. Trans. Roy. Soc., London, 203B, p. 1 Q. J. M. S., 59, p. 249 Q. J. M. S., 61, p. 1
Forficula auricularia(?)...	24–27 spg	12–14♂	11–14♂	10–14♂	Some chroms. univalent in 1st and may or may not divide	Payne, '14	Jour. Morph., 25, p. 559
Labidura riparia.....		6♂				Sinéty, '01	La Cellule, 19, p. 117
d. Gryllidae							
Gryllotalpa.....	23 spg	12♂				Baumgartner, '12	Science, 35, p. 937. (Paper read before Amer. Soc. Zool.)
Gryllotalpa borealis.....	23 spg 24 oog	12♂	11, 12♂		X and XY to poles in 1st	Payne' 12	Arch. Zellf., 9, p. 141
Gryllotalpa vulgaris.....	12 spg	6♂ (= 24 el)	6♂ (= 12 el)	6♂	Tetrads and dyads = separate elements	Vom Rath, '92 Vom Rath, '95	Arch. mikr. Anat., 40, p. 102 Arch. mikr. Anat., 46, p. 168
Gryllotalpa vulgaris.....	17 spg	9♂			X to pole in 1st	Senna, '11	Mon. Zool. ital., 22, p. 65
Gryllotalpa vulgaris.....	16 spg (= 17, one bivalent)	7♂	7♂	7♂	XY to poles in 1st. X united with a tetrad. X to pole in 1st. Two tetrads united in 1st. From correction in '14	Voinov, '12 Voinov, '14	C. R. Assoc. Biol., 72, p. 621 Arch. Zool. Exper. et gen., 54, p. 439
Gryllus assimilis (lactuosus?).....	29 spg	15♂	14, 15♂		X to pole in 1st	Baumgartner, '04	Biol. Bull., 8, p. 1
Gryllus desertus.....	21 spg	11♂			X to pole in 1st	Brunelli, '09	Mem. R. Acad. Lincei., ser. 5a., vol 7, p. 623
Gryllus domesticus.....	21 spg	11♂	10, 11♂	10, 11♂	X to pole in 1st	Baumgartner, '04	Biol. Bull., 8, p. 1

Gryllus domesticus.....	21 spg 22 oog 21♂ som 22♀ som	11♂			X in ♂; XX in ♀	Gutherz, '07 Gutherz, '08 Gutherz, '09	Arch. Mikr. Anat., 69, p. 491 Zentr. Physiol., 22, p. 61 Sitz. Gesel. Naturf. Fr. Berlin, 1909, pp. 410 and 565
Gryllus domesticus.....	21 spg	11♂	10, 11♂		X to pole in 1st	Meek, '13	Phil. Trans. Roy. Soc., London, 203B, p. 1
e. Locustidae							
Anabrus.....	33 spg	17♂	16, 17♂	16, 17♂	X to pole in 1st	McClung, '02 McClung, '14	Kansas Univ. Sci. Bull., 1, p. 185 Jour. Morph., 25, p. 651
Ceuthophilus sp?.....	37? spg	19♂ or 21♂ (2S)			X to pole in 1st. 2S to either pole in 1st or 2nd	Stevens, '12	Biol. Bull., 22, p. 219
Conocephalus.....	33 spg					McClung, '14	Jour. Morph., 25, p. 651
Decticus verrucivorus....	23 spg	12♂	11, 12♂	11, 12♂	X to pole in 1st	Vejdovsky, '12	Kgl. Böhm. Gesel. Wissen. Prag, 1912, p. 1
Decticus verrucosus.....	31 spg					Buchner, '09	Arch. Zellf., 3, p. 335
Diestrammena marmorata.....	57 spg	28♂	28, 29♂		X to pole in 1st	Schellenberg, '13	Arch. Zellf., 11, p. 489
Jamaicana flava Jamaicana subguttata Jamaicana unicolor ..	35 spg	18♂	17, 18♂	17, 18♂	X to pole in 1st. Association of 2 chroms. in some individuals	Woolsey, '15	Biol. Bull., 28, p. 163
Leptophyes punctatissima.....	31 spg 32 oog 31♂ som 32♀ som			15, 16♂	X to pole in 1st. XX in ♀ diploid	Mohr, '15	Arch. Zellf., 14, p. 151
Locusta viridissima.....	33 spg	17♂	16, 17♂	16, 17♂	X to pole in 1st	Otte, '06 Otte, '07	Zool. Anz., 30, p. 529 Zool. Jahrb., 24, p. 431
Locusta viridissima.....	29 spg 30 oog 29♂ som 30♀ som				X to pole in 1st. XX in ♀ diploid	Mohr, '15	Arch. Zellf., 14, p. 151

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Microcentrum	33? spg	17♂	16, 17♂	16, 17♂	X to pole in 1st	McClung, '02	Kansas Univ. Sci. Bull., 1, p. 185
Orchesticus	33 spg	17♂	16, 17♂	16, 17♂	X to pole in 1st	McClung, '02 McClung, '14	Kansas Univ. Sci. Bull., 1, p. 185 Jour. Morph., 25, p. 651
Orphania denticauda	31 spg	15♂ (= 16, X at pole in metaphase)	15, 16♂	15, 16♂	X to pole in 1st	Sinéty, '01	La Cellule, 19, p. 117
Scudderia	33 spg	17♂	16, 17♂	16, 17♂	X to pole in 1st	McClung, '02 McClung, '14	Kansas Univ. Sci. Bull., 1, p. 185 Jour. Morph., 25, p. 651
Steiroxys trilineata	29 spg	15♂	14, 15♂	14, 15♂	X to pole in 1st	Davis, '08	Bull. Mus. Comp. Zool. Harvard, 53, p. 57
Steiroxys trilineata	29 spg	15♂	14, 15♂		X to pole in 1st	Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
Stenopelmatus	47 spg		23, 24♂		X to pole in 1st. (From correction in '09)	Stevens, '05 Stevens, '09	Carnegie Inst. Pub. no. 36, p. 1 Jour. Exp. Zool., 6, p. 101
Troglophilus sp?	ca. 20 oog					Buchner, '10	Arch. Zellf., 5, p. 449
Xiphidium	33 spg	17♂	16, 17♂	16, 17♂	X to pole in 1st	McClung, '02 McClung, '08 McClung, '14	Kansas Univ. Sci. Bull., 1, p. 185 Kansas Univ. Sci. Bull., 4, p. 255 Jour. Morph., 25, p. 651
f. Mantidae							
Mantis religiosa	14 spg	14♂ (double = 28)	7♂ (double = 14) 14♀	7♂, 14♂ pron 7♀, 14♀ pron	Chroms. divide just before fertilization	Giardina, '97	Mon. Zool. ital., 8, p. 275

g. Phasmidae

Aplopus mayeri	35 spg 36 ♀ som	18♂	17, 18♂	17, 18♂	X to pole in 1st	Jordan, '08 Jordan, '08	Anat. Anz., 32, p. 284 Carnegie Inst. Pub. 102, p. 13
Bacillus linearis		8–10♂				Carnoy, '85	La Cellule, 1, p. 189
Bacillus rossii	20 oog 20 cl	18–20♀	ca. 20♀		Parthenogenetic. 2 polar bodies	von Baehr, '07 von Baehr, '12	Zool. Jahrb., 24, p. 175 La Cellule, 27, p. 383
Leptynia attenuata	36 spg (= 37) 36 oog	18♂ (= 19)	18♂ (= 18, 19)		X attached to another chrom. To pole in 1st	Sinéty, '01	La Cellule, 19, p. 117

d. Myriapoda

1. Chilopoda

Geophilus linearis		8♂	8♂	8♂		Bouin and Collin, '01 P. and M. Bouin, '03	Anat. Anz., 20, p. 97 C. R. Soc. Biol., 55, p. p. 763
Lithobius forficatus		16–24♂				Carnoy, '85	La Cellule, 1, p. 189
Lithobius forficatus		22–24♂				P. and M. Bouin, '02	C. R. Assoc. Anat., 4, p. 74
Lithobius mordax Lithobius multidentatus Lithobius sp?		25♂			X	Blackman, '07	Proc. Amer. Acad. Arts and Sci., 42, p. 487
Scolopendra dalmatica		20–24♂				Carnoy, '85	La Cellule, 1, p. 189
Scolopendra heros	33 spg	17♂	16, 17♂	16, 17♂	X to pole in 1st	Blackman, '03 Blackman, '05 Blackman, '10	Biol. Bull., 5, p. 187 Bull. Mus. Comp. Zool. Harvard, 48, p. 1 Biol. Bull., 19, p. 138
Scutigera coleoptrata		18♂			Accessory divides in both divisions	Bouin and Ancel, '11	C. R. Assoc. Anat., 13, p. 104
Scutigera forceps	37 spg	19♂	18, 19♂		X to pole in 1st	Medes, '05	Biol. Bull., 9, p. 156

2. Diplopoda

Pachyiulus varius	25 spg	13♂	12, 13♂		X to pole in 1st	Oettinger, '08 Oettinger, '09	Zool. Anz., 33, p. 164 Arch. Zellf., 3, p. 563
Polyxenus sp?	prob. 16 spg	8♂	8♂			Sokoloff, '14	Zool. Anz., 44, p. 558

II. ARTHROPODA—Continued

e. ONYCHOPHORA

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Peripatus	28 spg (23–34) 28 oog 28 som	14♂	14♂	14♂		Montgomery, '00	Zool. Jahrb., 14, p. 277

III. COELENTERATA

a. HYDROZOA

1. Leptolinae

a. Anthomedusae

Clava squamata		ca. 16♀				Harm, '02	Zeit. wiss. Zool., 73, p. 115
Clavatella prolifera (= Eleutheria dichotoma)		6♀				Müller, '08	Zeit. wiss. Zool., 89, p. 28
Cordylophora lacustris		10–12♀				Morgenstein, '01	Zeit. wiss. Zool., 70, p. 567
Eudendrium ramosum		13?♀				Beckwith, '14	Jour. Morph., 25, p. 189
Hydra dioecia Hydra fusca Hydra viridis	12 spg	6♂ 12♀	6♂ 6♀	6♂ 6♀	Reduction in 1st anaphase in ♀	Downing, '05 Downing, '09	Zool. Jahrb., 21, p. 379 Zool. Jahrb., 28, p. 295
Hydra grisea		12–14♀				Brauer, '91	Zeit. wiss. Zool., 52, p. 169
Hydra grisea		16♀				Wager, '09	Biol. Bull., 18, p. 1
Hydractinia echinata	12–16 cl					Smallwood, '09	Biol. Bull., 17, p. 209
Hydractinia echinata		14?♀				Beckwith, '14	Jour. Morph. 25, p. 189
Pennaria tiarella		10–14♀ (prob. 10)				Hargitt, '09	Bull. Mus. Comp. Zool. Harvard, 53, p. 161
Pennaria tiarella	14? cl					Smallwood, '09	Biol. Bull., 17, p. 209

Tiara sp?	28 cl	14♀	14♀	14♀		Boveri, '90	Zellenstudien III, or Jen. Zeits., 17, p. 314
Tubularia mesembryanthemum		ca. 12♀				Brauer, '91	Zeit. wiss. Zool., 52, p. 551
b. Leptomedusae							
Aequorea forskalea	12 cl		6♀			Häcker, '92	Arch. mikr. Anat., 40, 243
Campanularia fluxuosa	20 cl	10♀				Hargitt, '13	Jour. Morph., 24, p. 383
Gonothyrea loveni		8♀				Wulfert, '02	Zeit. wiss. Zool., 71, p. 296
2. Trachylinae							
Cunina proboscidea		28+♂ 30♀		14+♂		Stschelkanowzew, '06	Mit. Zool. St. Neapel, 17, p. 433
Gonionemus murbachii	24–25 spg prob. 24 oog 24 cl prob. 24 som	prob. 12♂	prob. 12♂	prob. 12♀		Bigelow, '07	Bull. Mus. Comp. Zool. Harvard, 48, p. 287
b. Scyphozoa							
Aurelia flavidula	18–20 cl	9–10♀				Hargitt, '10	Jour. Morph., 21, p. 217